



Automotive Plastics NEWS

MARCH/APRIL 2018
VOLUME 47, ISSUE 3

INNOVATION



ACCE 2018 COMPOSITES | Driving Innovation

Plans are well underway for the 2018 SPE Automotive Composites Conference & Exhibition (ACCE). This year's show returns September 5-7, 2018 to the Suburban Collection Showplace in Novi, Mich. in the Detroit area. Now in its 18th year, the ACCE is still the "World's Leading Automotive Composites Forum" drawing over 900 exhibitors, speakers, and attendees from 15 countries on five continents to the Detroit area.

"*Composites – Driving Innovation*," is the theme of this year's event reflecting the growing interest automotive OEMs have in the latest composites technologies. The 2018 ACCE is co-chaired by Dr. Alper Kiziltas, Lead Research Scientist, Ford Motor Company and SPE Automotive Div. vice-chair & education committee chair and Matthew E. Carroll, Engineering Group Manager, General Motors Company and SPE Automotive Div. chair.

18th-Annual
 **AUTOMOTIVE
COMPOSITES
CONFERENCE
& EXHIBITION**

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**AUTOMOTIVE DIVISION
MEETING SCHEDULE
& SPECIAL EVENTS
CALENDAR**



3rd-Annual TPO Shanghai Engineered Polyolefins Conference	ALL DAY March 27-29, 2018
AutoEPCON Presentation Deadline	April 8, 2018
SPE Auto. Div. Board Meeting American Chemistry Council - Auto. Ctr. 5750 New King Drive, Troy, MI, USA	5:30 - 7:30 p.m. April 9, 2018
ACCE Abstract Deadline	April 30, 2018
13th-Annual AutoEpcon Troy Marriott, Troy, MI, USA	PM April 30 ALL DAY May 1, 2018
ANTEC 2018 Orange County Convention Ctr., Orlando, FL	ALL DAY May 7-10, 2018
IAG Hall of Fame Nomination Deadline	May 31, 2018
SPE Auto. Div. Board Meeting American Chemistry Council - Auto. Ctr. 5750 New King Drive, Troy, MI, USA	5:30 - 7:30 p.m. June 11, 2018
ACCE Paper Deadline	June 15, 2018
SPE Auto. Div. Board Meeting American Chemistry Council - Auto. Ctr. 5750 New King Drive, Troy, MI, USA	5:30 - 7:30 p.m. August 20, 2018
SPE Auto. Div. Golf Outing Fieldstone Golf Club, Auburn Hills, MI USA	ALL DAY September 4, 2018
18th-Annual SPE Automotive Composites Conference & Exhibition (ACCE) The Diamond Banquet & Conference Center at the Suburban Collection Showplace Novi, MI USA	ALL DAY September 5-7, 2018
IAG Parts Nomination Deadline	September 15, 2018
First Round - Automotive Innovation Awards Judging Celanese Corp. Auburn Hills, MI USA	8:00 a.m.- 5:00 p.m. September 27-28, 2018
Second Round / Blue Ribbon - Automotive Innovation Awards Judging Celanese Corp., Auburn Hills, MI USA	8:00 a.m.- 5:00 p.m. October 5 2018
20th-Annual SPE TPO Automotive Engineered Polyolefins Conference (TPO) Detroit-Troy Marriott, Troy, MI USA	ALL DAY October 7-10, 2018
SPE Auto. Div. Board Meeting American Chemistry Council - Auto. Ctr. Troy, MI USA	5:30 - 7:30 p.m. October 15, 2018
48th-Annual SPE Automotive Innovation Awards Gala Burton Manor Livonia, MI USA	5:00-11:00 p.m. November 7, 2018

Automotive Division Board of Directors meetings are open to all SPE members. All events are listed on our website at

<http://speautomotive.com>

Email Matt Carroll at

auto-div-chair@speautomotive.com for more information.

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CHAIR'S WELCOME

by Matt Carroll,
SPE Automotive Division Chair



The Winter Season was supposed to be a slow time of year for the Automotive Division but a lot was happening both before and after the Holidays. In early December, we closed out the year with our final Board of Directors meeting and then celebrated with our sponsors on Sponsor Appreciation Night at the Ruth's Chris Steak House in Troy. We gathered with 50 of our closest and most personal friends in the Plastics Industry and toasted not only the SPE but also the Sponsors who make all the conferences, Plastivan visits and scholarships possible. As always, many thanks to our sponsors. We can't say that enough.

Ruth's Chris Steak House seems like such an odd name. Founder Ruth Fertel purchased a restaurant called Chris Steak House in May of 1965 in New Orleans, and the rest was history. Ruth's Chris Steak House battles with Fifth Third Bank for winner of my "worst company names" award; but the food was good.....

Also late in 2017, we started our planning meetings for the next ACCE. Dr. Alper Kiziltas of Ford Motor Company graciously agreed to co-chair the event with me and he not only setup regular meetings but also delineated various goals, roles and responsibilities such that we are already "geared up" for a very successful September event. Meetings have been ongoing every two weeks with the rest of our dedicated Executive Team:

- Past Chair – Rani Richardson, Dassault Systemes
- Chair Emeritus – Dale Brosius, Institute for Advanced Composites Manufacturing Innovation (IACMI)
- Sponsorship Chair and MarCom – Teri Chouinard, Intuit Group
- Treasurer and Administrative – Bonnie Bennyhoff, SPE Automotive Division
- Technical Program Co-chair – David Jack, Baylor University
- Technical Program Co-chair – Leonardo Simon, University of Waterloo
- Technical Program Past-chair – Michael Connelly, Huntsman Polyurethanes
- Poster Competition Chair – Uday Vaidya, IACMI

along with our many other volunteers who are already starting to collect abstracts.



On December 13th, in the midst of an afternoon snowstorm, we had the presentations and voting for our first-ever scholarships of the Design in Plastics Competition in cooperation with Lawrence Technological University and the MAIN Event. See the article inside for more details about this exciting activity. Ford, FCA and GM all had judges interacting with the student applicants/presenters.

Once the New Year arrived, like the rest of the Automotive Industry, we in the SPE Automotive Division tightened our belts, sharpened our pencils, and got back to work. Bonnie Bennyhoff, our Treasurer, closed the books on our 2017 Innovations Award Gala (IAG) and Automotive Composites Conference and Expo (ACCE) events and confirmed that our budget is stable with some "cushion" money in the bank and enough "retained earnings" to continue funding our various charitable activities at a good level.

WELCOME



Gary Kogowski is leading the AutoEpcn planning activities which started promptly after the New Year. This Engineered Polymers conference is slated for May 1st at the Marriott in Troy, MI. Keynote speakers are already selected and an extra half day on April 30th is being added for an Institute of Scrap Recycling Industries (ISRI) Session. For our Annual Technical Conference (ANTEC 2018) in Orlando, FL the week of May 7th, Norm Kakarala and Tom Pickett are the Technical Program Chairmen and have received and reviewed a record number of papers. Even the IAG Team got into the act by already selecting a theme for 2018: "Plastics - Enabling Global Automotive Design"

On January 14th, our three scholarship winners from Lawrence Tech were awarded a total of \$5K at the MAIN Event at "Orchestra Hall with myself, Teri Chouinard, Steve Van Loozen and Chuck Jarrett in attendance. Then, on January

26th, we submitted our application to SPE Headquarters for the SPE Gold Pinnacle Award which goes to Sections and Divisions that best create and deliver member value in four categories of achievement: organization, technical programming, membership, and communication. I am confident and hopeful that, once again, we will receive the Gold Pinnacle Award at ANTEC 2018. Finally, on Feb 12th, we had our first Board meeting of 2018 and had great attendance and participation. Please see Secretary Crystal Van Houten's minutes in this newsletter. Loccino's of Troy supplied the carryout food to our new office location near Crooks and Square Lake Roads in Troy, MI.

With your help, 2018 is going to be another great year for the SPE Automotive Division!

Attention SPE Innovation Award Winners



INNOVATION AWARDS COMPETITION & GALA



HONORING THE BEST IN AUTOMOTIVE PLASTICS

We have a new logo to promote your pride in winning an award for your innovative technology in automotive plastics. All category award winning OEMs and suppliers are encouraged to include this logo in their marketing communications. Together, we are educating the industry to the benefits of plastics in automotive applications

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ACCE 2018 COMPOSITES | Driving Innovation

by Teri Chouinard,
SPE Automotive Div. Communications Chair

CALL FOR PAPERS

The Technical Program Co-Chairs this year are Dr. David Jack, Baylor University, Dr. Leonardo Simon, University of Waterloo and Dr. Michael Connolly, Huntsman and they are already forming the team and starting to hear from speakers and collect abstracts and papers. Those interested in speaking at this year's event should go to <http://SubmitACCEpapers.com> and upload **abstracts by April 30, 2018** and full papers or non-commercial presentations by **June 15, 2018**. Authors who submit full papers (not presentations) in the proper format will be considered for the conference's Best Paper Awards, which are presented during the event's opening ceremony. Questions for the peer review committee may be addressed to ACCEpapers@speautomotive.com.

CALL FOR NOMINATIONS FOR ACCE CONFERENCE PARTS COMPETITION

The ACCE committee also issued a "Call for Nominations" for its seventh-annual ACCE parts competition. Prizes for the Most Innovative Composites Application will be awarded in three categories — Materials Innovation and Process Innovation (selected by media and members of the SPE ACCE planning committee), and People's Choice (selected by conference attendees) — with winning teams receiving recognition and a trophy after lunch on the last day of the show. The competition includes parts in production on automotive vehicles including both light and heavy truck applications anywhere in the world and prototypes are also eligible.

There is no cost to enter the competition. Any registered conference participant (speaker, sponsor/exhibitor, or attendee) may submit a nomination. The only requirement is that the vehicle producer must give permission. Nomination instructions are available via <http://speautomotive.com/acce-forms> or from Teri Chouinard, teri@intuitgroup.com. Preliminary descriptions and photos about the **application's innovations are due July 31, 2018**, and should be eMailed to teri@intuitgroup.com. **Final complete nominations are due August 30, 2018**. Physical parts must be brought to the SPE ACCE for final review by judges during a formal walk-through at the show.

CALL FOR ACCE STUDENT SCHOLARSHIP APPLICATIONS

Since supporting students is a core activity of SPE, conference organizers have issued an annual "Call for Student Scholarship Applications" for three SPE ACCE scholarships, and an additional award from an endowed scholarship, still in the process of being funded, in honor of the late Dr. Jackie Rekhopf, a long-time SPE Automotive Division board member, SPE ACCE volunteer, and automotive composites expert. **Nominations are due April 1, 2018** and Winners will be selected from a pool of qualified applicants and announced in July prior to the 2017 SPE ACCE show.

All three ACCE scholarships are in the amount of \$2,000 USD. Two of the scholarships (given annually since 2007) are for full-time graduate students anywhere in the world who are pursuing degrees in Polymer Science, Composites, Plastics or a related Engineering discipline. The other ACCE scholarship is available for graduate or junior or senior undergraduate students pursuing similar academic programs at a university or college in the US state of Michigan. In addition to a letter of recommendation from an advisor or mentor, (and other SPE foundation requirements), students must provide a succinct 2-page essay explaining how their planned work will benefit polymer composites usage in the automotive or other ground-transportation industry. Winning students are required to submit a formal paper on the work by June the following year and are expected to present their results in person at that next year's SPE ACCE conference.

ACCE 2017 SCHOLARSHIP WINNERS



Benjamin Blandford, Baylor University; Rani Richardson, chair, 2017 SPE ACCE, and director, CATIA Technical Sales, Dassault Systèmes



Christopher Hershey, Michigan State University; Rani Richardson, 2017 SPE ACCE chair, director, CATIA Technical Sales, Dassault Systèmes



The **Dr. Jackie Rehkopf endowed Scholarship** (\$5,000 USD) will be awarded to a full-time graduate student studying engineering or science with plans to work in the field of transportation composites. If there are no qualified graduate applicants, two \$2,500 USD awards may be awarded to suitable undergraduate applicants. As with the ACCE scholarships, a letter of recommendation from the student's advisor/mentor and a 2-page essay is required showing planned work and how it benefits composites usage in the automotive or other ground-transportation industry. Work supported by the scholarship must be formally presented at an SPE technical conference like the SPE ACCE or published in an SPE technical journal.

Applications for ACCE, Rehkopf, and many other SPE scholarships are on the SPE Foundation® website at <http://www.4spe.org/Foundation>.

Deadline for submission is April 1, 2018.

For more information on the ACCE and Dr. Jackie Rehkopf Scholarships, contact:

- Dr. Ian Swentek, Hexion, 519.562.9158, ian.swentek@hexion.com
- Dr. David Jack, Baylor University, 254.710.3347, David_Jack@baylor.edu

Those interested in contributing to the Dr. Jackie Rehkopf endowed scholarship should send a check (made out to The SPE Foundation) to:

The SPE Foundation - Rehkopf Scholarship
 Attn: Eve Vitale
 6 Berkshire Blvd, Suite 306
 Bethel, CT 06801 USA

PLEASE mark in the Notes section of your check that the funds are for the Rehkopf Scholarship so they are applied to the correct fund. Then please send an eMail to News@SPEAutomotive.com and let us know how much you have contributed so we can keep track of the scholarship. For more information, call +1 203.740.5457 or email foundation@4spe.org. Donations made by U.S. citizens are tax deductible.

CALL FOR ENTRIES FOR ACCE STUDENT POSTER COMPETITION

The ACCE team also issued an invitation for entries on innovative composites technologies for automotive and ground transportation for its tenth-annual student poster competition. Judges made up of media, industry experts,

and SPE board members will review all posters with student authors on the first day of the conference. First-, second-, and third-place awards will be presented to winners in graduate and undergraduate categories during a special ceremony after lunch on the event's second day.

Students and their posters will be ranked according to the following criteria:

- 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;
- Conclusions are supported by information presented;
- Presentation (display aesthetics are pleasing and there is a logical flow between sections);
- Knowledgeable (presenter has a good grasp of the subject);
- Understandability (poster is effective even without student being present to explain it); and
- Overall rank vs. other posters and presenters.

Since 2008, the SPE ACCE poster competition has been organized annually by Dr. Uday Vaidya, chief technology officer, Institute for Advanced Composites Manufacturing Innovation (IACMI) and professor and governor's chair-Advanced Composites Manufacturing at University of Tennessee-Knoxville. He is supported by Dr. David Jack, professor, School of Engineering & Computer Science, Baylor University.

ACCE 2017 POSTER COMPETITION WINNERS



First-place PhD student category winner Zhaogui Wang, Baylor University; JP Wiese, marketing manager, Asahi Kasei Plastics, 2017 student poster competition sponsor



First-place MSc student category winner Siegfried Werner, University of Wisconsin Madison; JP Wiese, marketing manager, Asahi Kasei Plastics, 2017 student poster competition sponsor



First-place undergraduate student category winner Ian Major, University of Guelph; JP Wiese, marketing manager, Asahi Kasei Plastics, 2017 student poster competition sponsor



Call for Student Poster Competition ENTRIES (Cont.)

Students interested in participating in the 2018 competition should contact Prof. Vaidya at ACCEposters@speautomotive.com. **Abstracts are due by June 30, 2018** and digital copies of **posters are due by August 20, 2018**. A poster template is available on the ACCE website <http://speautomotive.com/acce-forms> and students will need to bring physical versions of their posters with them to the conference, which they can attend free of charge. Students in the competition will receive a partial travel stipend and a shared hotel room provided by SPE, as well as free student membership in SPE.

FIRST KEYNOTE SPEAKER ANNOUNCED FOR SPE® ACCE 2018

John Viera – *Global Director, Sustainability and Vehicle Environmental Matters for Ford Motor Co.*

The SPE Automotive Composites Conference (ACCE) team is announcing the first keynote speaker for their 18th annual event September 5 - 7, 2018 at the Suburban Collection Showplace in Novi, Mich. in the Detroit suburbs. John Viera, global director, Sustainability and Vehicle Environmental Matters at Ford Motor Co. will present a keynote entitled ***“Sustainable Manufacturing at Ford and How Composites Can Help to Address Industry Challenges.”*** The presentation will outline the future of sustainable manufacturing at Ford, including powertrain, water and energy strategies. John will also highlight how composites will play an important role in Ford’s commitment to advancing sustainable technologies, including the development of hybrid cellulose composites with International Paper and Celanese. The presentation will include excerpts from Ford Motor Company’s 2016-17 Sustainability Report. “Composites are playing an important role helping us to reduce vehicle weight and increase fuel efficiency,” notes Viera. “As our industry moves toward greater sustainability in manufacturing, composites technologies will continue to support this effort and by addressing challenges – including recyclability of materials - will result in even greater opportunities,” added Viera.

In addition to keynote presentations, The ACCE features approximately 80 technical presentations, three roundtable discussions, and over 100 sponsors with close to 80 exhibits highlighting advances in materials, processes, and equipment for both thermoset and thermoplastic composites in a wide variety of transportation applications. Networking breakfasts, lunches and receptions enhance the value of the event that attracts over 900 attendees worldwide. The Automotive and Composites Division of the Society of Plastics Engineers (SPE®) jointly produce the ACCE to educate the automotive industry about the benefits of composites in automotive applications.

“Composites – Driving Innovation,” is the theme for this year’s event reflecting the growing interest automotive OEMs have in the latest composites technologies. The 2018 ACCE is co-chaired by Dr. Alper Kiziltas, Lead Research Scientist, Ford Motor Company and SPE Automotive Div. Vice-Chair & Education Committee Chair and Matthew E. Carroll, Materials Engineering, General Motors Company and SPE Automotive Div. Chair. “I am looking forward to continuing the growth of ACCE and growing applications for composites as a sustainable technology,” noted Dr. Kiziltas. “Composites are an ideal material for lightweighting, which helps us to meet challenging emissions and fuel-economy standards by eliminating mass,” noted Carroll.

The technical program includes approximately 80 paper presentations (30 min. ea.) organized into the following categories: Advances in Thermoplastics Composites; Virtual Prototyping & Testing; Bonding, Joining & Finishing; Sustainable Composites; Opportunities & Challenges with Carbon Composites; Advances in Reinforcement Technologies; Nanocomposites; Enabling Technologies; Additive Manufacturing & 3D Printing and Advances In Thermoset Composites. The mission of SPE is to promote scientific and engineering knowledge relating to plastics worldwide and to educate industry, academia, and the public about these advances. SPE’s Automotive Division is active in educating, promoting, recognizing, and communicating technical accomplishments in all phases of plastics and plastic-based composite developments in the global transportation industry. Topic areas include applications, materials, processing, equipment, tooling, design, and development.

* SPE is a registered trademark of the Society of Plastics Engineers. All other trademarks are the property of their respective owners.

ABOUT JOHN VIERA

John Viera is the Global Director, Sustainability & Vehicle Environmental Matters at Ford Motor Company, a position he has held since January, 2007. Mr. Viera is responsible for developing global sustainable business plans and



policies, leading the Company's environmental negotiating efforts with global regulatory bodies, reporting externally on the Company's environmental and social performance, and leading the Company's engagement and partnerships with non-government organizations (NGOs) and other external stakeholders.

Viera has held several positions within Ford Motor Company during his 34 year tenure before being named to his current position. For the first thirteen years of his career, he worked in the company's Truck Division with responsibilities that included leading the Company efforts in the development of its first natural gas-fueled trucks and leading the Company's Global Truck Computer Aided Design organization.

In 1997, Viera was appointed Manager, Plant Engineering Vehicle Team, Explorer and Mountaineer programs. Located in Louisville, Kentucky, Viera was responsible for all on-site engineering personnel for Explorer plants in Louisville, St. Louis, and Valencia, Venezuela. He returned to Michigan in 1999 as Chief Engineer for the Ranger Pickup and Electric Ranger. In 2002, Viera took on the Company's mid-term cost reduction initiative, building a team which delivered \$1.2 billion of savings in eighteen months, beating his assigned target by over a year. In 2003, Viera became Chief Engineer for the Expedition and Navigator Full Size SUVs, with complete responsibility for current and future model programs.

Mr. Viera currently serves as the Co-Chair of the Erb Strategic Advisory Board at the University of Michigan, the Advisory Board for the Graham Institute of Environmental Sustainability at the University of Michigan, the Advisory Board of CALSTART, the Advisory Board of Sustainable Brands,

and the Steering Committee for UC Davis' Asilomar Biennial Conference. Mr. Viera has recently served on the Advisory Board at Georgia Tech in Atlanta, the Energy Advisory Committee at the Museum of Science and Industry in Chicago, and the Department of Homeland Security's Sustainability and Efficiency Task Force in Washington D.C. Viera is also an Executive Member of the Ford African Ancestry Network (FAAN), with a focus on mentoring and counseling. A native of Chicago, Viera attended the University of Michigan, receiving his Bachelor of Science degree in Mechanical Engineering in 1984 as well as a Master of Business Administration degree in 1992.

ABOUT THE SPE ACCE

Held annually in suburban Detroit, the ACCE draws over 900 speakers, exhibitors, sponsors, and attendees and provides an environment dedicated solely to discussion and networking about advances in transportation composites. Its global appeal is evident in the diversity of exhibitors, speakers, and attendees who come to the conference from Europe, the Middle East, Africa, and Asia / Pacific as well as North America. Fully one-third of attendees indicate they work for automotive and light truck, agriculture, truck & bus, or aviation OEMs, and another 25% represent tier suppliers. Attendees also work for composite materials, processing equipment, additives, or reinforcement suppliers; trade associations, consultants, university and government labs; media; and investment bankers. The show has been jointly sponsored by the SPE Automotive and Composites Divisions since 2001.

THE MISSION OF SPE

The missions of SPE is to promote scientific and engineering knowledge relating to plastics worldwide and to educate industry, academia, and the public about these advances. SPE's Automotive Division is active in educating, promoting, recognizing, and communicating technical accomplishments in all phases of plastics and plastic-based composite developments in the global transportation industry. SPE's Composites Division does the same with a focus on plastic-based composites in multiple industries. Topic areas include applications, materials, processing, "equipment, tooling, design, and development. For more information see www.speautomotive.com and www.specomposites.org. For more information on the *Society of Plastics Engineers*, see www.4spe.org.

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New Workshop: Meeting Changing Material Flammability Requirements for Ground Transportation

April 4-5, 2018
Dearborn Inn,
Dearborn, Michigan

SPE Auto Div. Members:
50% off registration
good until March 27th

Join us for a 2-day workshop offering insight into trends in bus, truck and automotive design that will affect the choice of flame retardants and materials in transportation solutions.

Attendees will hear from automotive and ground transportation Tier one suppliers and regulatory experts regarding fire safety needs in the transportation industry. The presentations will include fire retardants technologies, test methods, environmental and regulatory updates, advanced manufacturing and materials technologies. This conference will offer opportunities for interaction with speakers and attendees. The workshop is being co-organized by the Society for the Advancement of Material and Process Engineering (SAMPE) and the Society for Plastics Engineers (SPE).

WHO SHOULD ATTEND:

Transportation OEMs, Tier Ones, Designers, Manufacturing, Market Development, Supply Chain and Regulatory

FEATURED SPEAKERS TO DATE: A. Schulman; Susan Mack, **Delphi**; Cindy Liu, **Clariant (China)**; Robert Crescenzo, **Lancer Insurance Company**; Adrian Beard, **PINFA/Clariant (Germany)**; Roger Avakian, **Polyone**; Jason Huczek, **Southwest Research Institute**; Rick Barone, **Thermal Research (TPR2)**; Sean Crow, **Tri-Iso**; Tom Fabian, **UL**

INVITED: U.S. NHTSA; University of Michigan; General Cable; Unfrax I LLC; Case Forensics (Jensen Hughes Co.); SPE Automotive



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CONTACT:

To register go to:
www.pinfa-na.org
or for immediate assistance call
Debbie Wagner at 908-832-2207
or email dwagner@pinfa-na.org

SPE Auto Div. Members:
50% off registration
good until March 27th



**Located at the Historic
Dearborn Inn**

Workshop Co-sponsors:



2018 Conference: Meeting Changing Material Flammability Requirements for Ground Transportation

Sponsorship Opportunities

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Options

Gold Sponsor:

\$5000.00 (for a current non-member FR producer- Introductory full membership for one year plus 2 free conference attendees)

Bronze Sponsor:

\$2000.00 (includes 2 free conference attendees)

Silver Sponsor:

\$3000.00 (for a current non-member – include a one year Associate membership to Pinfa and two free conference attendees)

Coffee Break Sponsorship:

\$1500.00

Co-sponsor of Evening Reception:

\$1500.00

Table Top: Open During Coffee Breaks, Luncheons and Receptions:

\$750.00 per 8 foot table

CONTACT: Debbie Wagner at 908-832-2207 or email
dwagner@pinfa-na.org

Meeting Fire Safety Requirements In Automotive Design
September 27-28, 2017/April 4-5, 2018
Dearborn Inn, Dearborn, Michigan

Workshop Co-sponsors:





New This Year!

We've added a half-day program on April 30 with the Institute of Scrap Recycling Industries, Inc.



As the "Voice of the Recycling Industry™", the Institute of Scrap Recycling Industries, Inc. (ISRI), serves its membership through education and advocacy concerning the issues that define the scrap recycling industry. We are excited to be part of the SPE Auto EPCON conference.

Topics for the ISRI conference scheduled for Monday, April 30, 2018 will include:

Workshop 1:

Embracing Design for Recycling Concepts and How to Make Your Products Environmentally Friendly

Workshop 2:

Reducing Your Costs by Using Recycled Resins

We will conclude the sessions with a round-table discussion about how to facilitate circular economy in the Automotive Industry.

AUTOEPCON 2018 KEYNOTE SPEAKERS



Sarah (Ollila) Kleinbaum

Technology Development Manager for Joining of Dissimilar Materials, U.S. Department of Energy's Vehicle Technology Office

The Lightweight Materials National Laboratory Consortium

The Lightweight Materials National Laboratory Consortium, or LightMAT, is a network of 10 national laboratories with technical capabilities highly relevant to lightweight materials development and utilization. LightMAT provides straightforward access to resources and capabilities in this network via a single point of contact and works to match industry research teams with expertise and equipment found only at national laboratories.



Carla Bailo

President & CEO of the Center for Automotive Research (CAR)

Engineered Plastics and Composites in Future Mobility Applications

Carla Bailo will discuss the future of mobility and the potential impacts of automated, connected, electrified and shared mobility services on the traditional and emerging industry. Bailo will touch on opportunities for engineered plastics and composites in this rapidly evolving automotive and mobility landscape which includes Smart Cities, Smart Mobility and Smart Infrastructure.

EXHIBIT AND SPONSORSHIP OPPORTUNITIES AVAILABLE

Ed Luibrand | +1 248-512-0641
Chris Surbrook | +1 989-495-9367

ABSTRACT SUBMISSIONS

Sandra McClelland | sandra.mcclelland@solvay.com



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May 7-11, 2018 | Orlando, Florida USA

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THE PLASTICS SHOW



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ANTEC 2018 REPORT

Dr. Norm Kakarala, Tom Pickett



The SPE Annual Technical Conference (ANTEC) will take place at the Orange County Convention Center in Orlando, Florida from **May 7 - 10, 2018**. ANTEC is the largest, most respected and well known technical conference in the plastics industry. It will be held in conjunction with NPE.

The ANTEC Automotive Sessions have twenty three presentations that will be presented on Wednesday, May 9 and Thursday, May 10. On Wednesday morning from 8:00 to 11:30 am there are 7 presentations on Materials Development for Automotive. On Thursday May 10 at 8:00 am, keynote speaker, Michael Ruby, will talk on "Intelligent Automotive Design with Plastics". Following the keynote address there are six presentations on Design and Applications. On Thursday afternoon from 1:30 to 6:00 pm are seven presentations on Process and Simulations. At the end of the last presentation on Thursday, May 10th at 6:00 pm, the SPE Automotive Division Business Meeting will take place in the same presentation room.

The Co-Chairs of the 2018 ANTEC Automotive Division Session are Norm Kakarala and Tom Pickett. Helping to review the papers for the ANTEC Automotive Sessions was Suresh Shah.

The details of the Automotive Sessions are listed in this newsletter.

For more information about ANTEC and a detail of the papers in the other sessions, visit the website: www.antec.ws

WEDNESDAY, 5/9/18 AUTOMOTIVE SESSION: MATERIALS DEVELOPMENT

8:00	Dr. Suresh Shah	Innovations in Automotive Plastics "Materials and Processes"
8:30	Mark Barrera	Reflections on Evolution and Growth of TPOs.
9:00	Laura Weaver	Low Birefringent Cellulose Acetate Propionates for Plastic Display Lens Covers
9:30	Paula Kruger	Introduction to the usage of thermally conductive compounds in automotive lighting
10:00	Rudy Gorny	New resin for liquid cooled modules in electric vehicle battery packs (EVBP)
10:30	Josh McIlvaine	Improving long term corrosion resistance in electronic applications
11:00	Josh McIlvaine	Advances in Hydrolysis resistance PBT resins for electronic applications including connectors and HEV components

THURSDAY, 5/10/18 AUTOMOTIVE SESSION: DESIGN & APPLICATIONS

8:00	Michael Ruby	Intelligent Automotive Design with Plastics
8:30	Dr. Suresh Shah	Innovations in Automotive Plastics "Applications"
9:00	Tom Pickett	Chemical Resistance of PMMA, ASA and ASA+PC for Automotive Exterior Trim Applications
9:30	Karnik Tarverdi	Recycled and Waste Materials in Selected Automotive Applications
10:00	Pavan Puranik	Hybrid Pedestrian-safe Solution for the Automotive Industry
10:30	Carlos Pereira	Aerodynamic Optimization of a Day-Cab Fairing
11:00	Vasudev Nilajkar	Computational Modeling of Impedance Tube and Validation for Tuning the Acoustic Transmission Loss of Polymeric Materials

THURSDAY, 5/10/18 AUTOMOTIVE SESSION: PROCESS & SIMULATIONS

1:30	Jeff Munro	Connecting Rheology of Polyolefin Elastomers to Dispersion in a Polypropylene Matrix via Modeling and Experiments with Simple Flow Fields
2:00	Steve McClintock	Core-Back Technology for Automotive Body Interior Applications
2:30	Jim Hsu	Dynamic Water Penetration Prediction for Push-Back Process in Water-Assisted Injection Molding
3:00	Werner Posch	How plastics helps to conquer the new challenges of vehicle electrification
3:30	Tanmay Pathak	Development of Low Emission Polyolefin Composites for Automotive Interiors
4:00	Shuoran Du	Effect of Grain Pattern and Talc Content on Scratch and Mar Behaviors of Textured Thermoplastic Olefins
4:30	Fred Chang	Vehicle Lightweighting and Improved Crashworthiness - Plastics and Hybrid Solutions
5:00	Cheolhee Park	A Novel Glass Fiber Reinforced Compound for Automotive Interior Parts
5:30	Steve Wilson	Bumper to Bumper - Removing Contaminants from Molded Plastic Parts with Dry Ice
6:00	Matt Carroll	Automotive Division Business Meeting



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NOVEMBER 7, 2018

Call for Nominations for the SPE Automotive Division **LIFETIME ACHIEVEMENT AWARD**

The Automotive Division of the Society of Plastics Engineers (SPE®) is announcing a Call for Nominations for the "Lifetime Achievement Award" (**due March 31, 2018**) for presentation at its 48th-annual **Automotive Innovation Awards Gala** on Wednesday, November 7, 2018 at the Burton Manor in Livonia, Mich. First given in the year 2001, The Lifetime Achievement Award recognizes leadership and technical achievements of individuals whose work – in research, design, and/or engineering, etc. – has led to significant integration of polymeric materials on automotive vehicles.

The Criteria that is evaluated for consideration for the Lifetime Achievement Award is as follows:

- 25 or more years of experience and significant contributions in the automotive plastics industry
- Formal Education/Degrees in chemical, plastics, mechanical, electrical, materials or other engineering and/or business management or related areas
- Leadership and years of service in SPE (Society of Plastics Engineers), SAE (Society of Automotive Engineers), ESD (Engineering Society of Detroit), SAMPE (Society for the Advancement of Materials and Process Engineering) and other similar industry associations – including the size/number of members in the associations
- Patents awarded for innovations in automotive, plastics, chemical and other similar industry advancements
- Participation and leadership in industry technical conferences including number of papers presented, keynotes, and committee leadership
- Other industry awards received for innovation, research and advancements including but not limited to "Lifetime Achievement Awards" from other associations, "Honored Service Member," "Fellowships," "Best Paper," and other honors

To submit a nomination for the SPE Automotive Div. Lifetime Achievement Award,

prepare a word document outlining the candidate's qualifications using the information above as a guideline and please limit the information to 2 – 3 pages. Email your nominations to Fred Deans, SPE Lifetime Achievement Award Chairman fdeans@alliedcomptech.com and copy Nippani Rao, SPE Lifetime Achievement Award Co-Chairman nippanirao@aol.com.

Past SPE Automotive Lifetime Achievement Award Winners include:

- J.T. Battenberg III, former chairman and chief executive officer of Delphi Corp. in 2001
- Bernard Robertson, then executive vice-president of DaimlerChrysler in 2002
- Robert Schaad, chairman of Husky Injection Molding Systems, Ltd. In 2003
- Tom Moore, retired vice-president, Liberty and technical Affairs at then DaimlerChrysler in 2004
- Mr. Shigeki Suzuki, general manager – Materials Division, Toyota Motor Co. in 2005
- Barbara Sanders, then director-Advanced Development & Engineering Processes, Delphi Corp. in 2006
- Josh Madden, retired executive at General Motors Corp. (GM) & Volkswagen of America in 2007
- Frank Macher, former CEO of Collins & Aikman Corp., Federal Mogul Corp., and ITT Automotive in 2008
- Irv Poston, retired head of the Plastics (Composites) Development-Technical Center, General Motors Corp. (GM) in 2009
- Allan Murray, Ph.D., retired PNGV Director, Ford Motor Co. in 2010



- David B. Reed, P.E., retired staff engineer, Product Engineering, General Motors Corp. (GM) in 2011
- Gary Lownds, P.E., then chief technology officer, Plasan Carbon Composites in 2012
- Roy Sjöberg, P.E., retired staff engineer – Body, Chevrolet-Pontiac – Canada Div., General Motors Corp. (GM) and retired executive engineer – Viper Project, Chrysler Corp. in 2013
- Dr. Norm Kakarala, retired senior technical fellow, Inteva Products LLC in 2014
- Frederick Deans, P.E., chief marketing officer, Allied Composite Technologies LLC in 2015
- Dr. Lawrence T. Drzal, university distinguished professor of Chemical Engineering and director-Composite materials and Structures Center at Michigan State University in 2016
- Dr. Suresh Shah, retired, Senior Technical Fellow at Delphi Corporation, formerly General Motors – ACG (Automotive Components Group) 2017

The SPE Automotive Innovation Awards Program is the oldest and largest competition of its kind in the automotive and plastics industries. This annual event currently draws over 800 OEM engineers, automotive and plastics industry executives, and media. As is customary, funds raised from this event are used to support SPE educational efforts and technical seminars, which help to educate and secure the role of plastics in the advancement of the automobile.

The mission of SPE is to promote scientific and engineering knowledge relating to plastics worldwide and to educate industry, academia, and the public about these advances. SPE's Automotive Division is active in educating, promoting, recognizing, and communicating technical accomplishments in all phases of plastics and plastic based-composite developments in the global transportation industry. Topic areas include applications, materials, processing, equipment, tooling, design, and development.

For more information about the SPE Automotive Division and the Innovation Awards Competition and Gala see www.speautomotive.com. For more information on the Society of Plastics Engineers, see www.4spe.org.

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NOVEMBER 7, 2018

CALL FOR NOMINATIONS

- HALL OF FAME AWARD
- MOST INNOVATIVE USE OF PLASTICS AWARDS

For more info and to submit nominations, go to: [www.http://speautomotive.com/innovation-awards-gala](http://speautomotive.com/innovation-awards-gala).



The Automotive Division of the Society of Plastics Engineers (SPE®) is announcing a "Call for Nominations" for its 48th-annual **Automotive Innovation Awards Gala**, the oldest and largest recognition event in the automotive and plastics industries. This year's Awards Gala will be held Wednesday, **November 7, 2018** at the Burton Manor in Livonia, Mich. Winning part nominations (*due by September 15, 2018*) in 10 different categories, and the teams that developed them, will be honored with a **Most Innovative Use of Plastics** award. A **Grand Award** will be presented to the winning team from all category award winners. An application that has been in continuous use for 15 years or more, and has made a significant and lasting contribution to the application of plastics in automotive vehicles, (*nominations due by May 31, 2018*) will be honored with a **Hall of Fame** award.

SPONSORSHIP OPPORTUNITIES

This annual event currently draws over 800 OEM engineers, automotive and plastics industry executives, and media. A variety of sponsorship packages - including tables at the banquet, networking receptions, advertising in the program book, signage at the event and more are available. Contact Teri Chouinard of Intuit Group at teri@intuitgroup.com.



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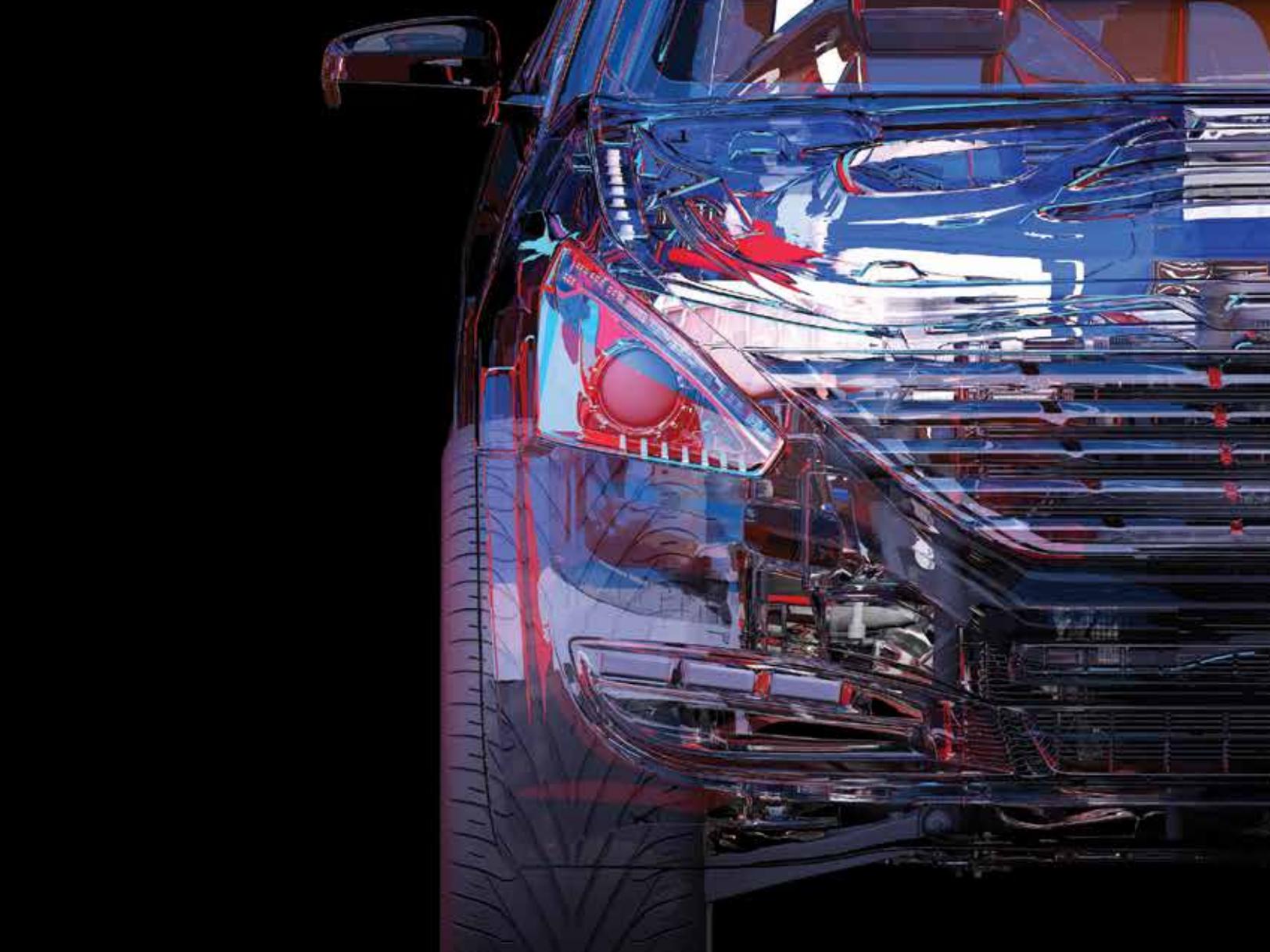
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SPE Design in Plastics Scholarship Competition

At the MAIN Event (MotorCity Auto Industry Night) on January 14th, 2018, three Scholarships were awarded by the SPE Automotive Division to worthy students for their usage of plastics in designs. The student winners, selected from applicants in the Lawrence Technological University's (LTU) Transportation Design and Industrial Design programs, are:

1st Place: Joshua DeSouza | 2nd Place: Veronica Beers | 3rd Place: Dhwanil Panchil



*Chuck Jarrett, SPE Automotive Division, student winners
Dhwanil Panchil, Joshua DeSouza and Veronica Beers and Gordo Platto, Ford Design Chief*



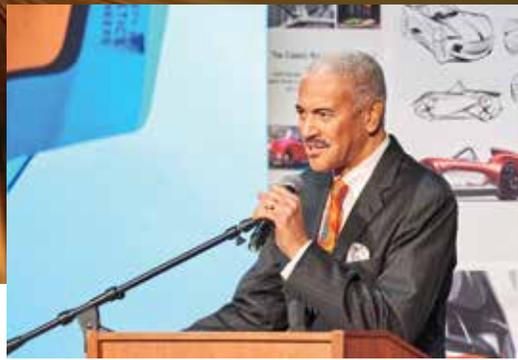
The Automotive Division of the SPE, led by Chuck Jarrett and Steve Van Loozen, challenged students to explore the innovative use of plastics as an enabler for design. Special thanks for the success of the program this year also goes to Gordon Platto, Design Director at Ford Motor Company along with Mark Trostle, Head of Dodge and SRT Design at FCA. A total of \$5K in scholarship funds were sent directly to LTU for the winning students' accounts.

Judging Criteria for the Competition included:

- Students required to develop a problem statement related to their design, with the solution set encompassing the innovative use of plastics
- Examples of how plastics are being used as an enabler in delivering their design theme
- How they enhanced and improved customers' experience; and made the product more user-friendly

- How they used integration features to deliver a more functional design
- What types of shape and form could be realized over traditional materials (steel, glass, aluminum)... and why?

In addition to the scholarships, the SPE Automotive Division co-sponsored the MAIN Event 2018 at Orchestra Hall at 3711 Woodward in Detroit, MI. The 2,014-seat hall, home to the Detroit Symphony Orchestra and now part of the Max M. Fisher Music Center, was built in 1919 and was added to the National Register of Historic Places in 1971. It is a memorable venue for the MAIN Event, an annual celebration held on the eve of the first press day of the North American International Auto Show. Designers, Engineers and Media personalities attended for Designer Awards & Presentations and Chuck Jarrett, along with Gordon Platto from Ford Motor, presented the scholarships early in the Agenda.



Emcee Huel Perkins, Anchor Reporter at Fox-2 Detroit

Detroit television personality Huel Perkins emceed the event and brought cheers from the designers in the audience when he stated that he “is not interested in arriving at Orchestra Hall in an autonomous “pimple”. He wants to arrive in style; in the best designed vehicle out there”. Another highlight was when our Scholarship 1st place winner, senior Joshua DeSouza, announced that he had accepted a job with FCA’s design team.



LTU Professor Keith Nagara presenting the Industry Innovator of the Year trophy to Adrian Van Hooydonk, Sr VP, BMW Group Design

Also at the MAIN Event, “Digital Concept Vehicles” from AMG Mercedes (Project ONE), Volkswagen (sedric) and Audi (Aicon) were highlighted in videos, with the Mercedes concepts chosen as the winner. You can check out these concepts on-line. Matthias Mueller, VW Group CEO, was named Global Industry Executive of the Year and Adrian van Hooydonk of BMW was named Industry Innovator of the Year so a clean sweep by the German OEMs for these honors.



Gordo Platto, Ford Design Chief and Chuck Jarrett, SPE Automotive Division

Keith Nagara, LTU Professor of Design, is the “MasterMind” of the Main Event and was instrumental in the SPE Design in Plastics Scholarship Competition. Of course, he is located at LTU in Southfield, MI, which was founded in 1932 at the site where Henry Ford perfected the moving assembly line. The SPE Automotive Division looks forward to collaborating with Keith and his team again next year.

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EDUCATION REPORT

by Alper Kiziltas,
SPE Automotive Div. Education Chair

Automotive Division Sponsored PlastiVan® Visits 2016-17 & 2017-18 School Years

From the Automotive Division, just a quick update this issue. We continue our support of the SPE PlastiVan program with a commitment this year for 20 visits at \$31,500. A summary for this year is shown below:

AUTOMOTIVE DIVISION SPONSORED PLASTIVAN® VISITS 2016-17 & 2017-18 SCHOOL YEARS

	2016-2017	2017-2018 To Date	Totals
Middle School Students Served	2,345	193	2,538
High School Students Served	164	1,038	1,202
Number Served at Events	250	0	250
Total Visits	15	9	24
Cost	\$20,250	\$12,150	\$32,400
Cost Per Student Served	\$7.34	\$9.87	\$8.12
Total Served	2,759	1,231	3,990

At the February 12th Board Meeting, SPE Automotive Division volunteers agreed to award \$1000 to each of eight Michigan student chapters. The list includes:

FERRIS STATE UNIVERSITY

Big Rapids, MI
Sponsoring Section: Western Michigan
Faculty Advisor: Robert Speirs
SPE AD Volunteer: Crystal Van Houten

KETTERING UNIVERSITY

Flint, MI
Sponsoring Section: Detroit
Faculty Advisor: Susan Farhat
SPE AD Volunteer: Dave Reed

MICHIGAN STATE UNIVERSITY

East Lansing, Michigan
Sponsoring Section: Detroit
Faculty Advisor: Krishnamurthy Jayaraman
SPE AD Volunteers: F. Deans & N. Rao

MID-MICHIGAN COMMUNITY COLLEGE

Sponsoring Section: Detroit
Faculty Advisor: Steven L. Fosgard
SPE AD Volunteer: Steve Van Loozen

SCHOOLCRAFT COLLEGE

Livonia, MI
Sponsoring Section: Detroit
Faculty Advisor: Sassan Tarahomi
SPE AD Volunteer: Paula Kruger

UNIVERSITY OF MICHIGAN-ANN ARBOR

Ann Arbor, MI
Sponsoring Section: Detroit
Faculty Advisor: Richard Robertson
SPE AD Volunteer: Gary Kogowski

WESTERN MICHIGAN UNIVERSITY

Kalamazoo, MI
Sponsoring Section: Western Michigan
Faculty Advisor: Jay M. Shoemaker
SPE AD Volunteer: Alper Kiziltas

OAKLAND UNIVERSITY (NEW)

Rochester Hills, MI
Sponsoring Section: Detroit
Faculty Advisor: Mark Richardson
SPE AD Volunteers: Fred Deans with Samar Teli

Many thanks to our volunteers for carrying not only the cash but also our Mission and Message to these students!!

TREASURER'S REPORT

Bonnie Bennyhoff,
SPE Automotive Div. Treasurer



As we look to the 4th quarter of our fiscal year, I am pleased to report the financial health of the Automotive Division is excellent. All of our major events did well financially and Accounts Receivable are under control. With a good cushion of cash in reserve, the Division plans to increase outreach spending to strengthen our commitment to stated mission goals. Some of the areas identified were (1) expand support at SPE Student Chapters (2) award more scholarship money (3) increase funding for PlastiVan visits and (4) provide 3D printing equipment (& mentoring) to deserving middle and high schools.

I am also pleased to welcome Paula Kruger of DSM as our assistant treasurer. With the significant volume of transactions occurring, it's important to insure accounting of our assets and liabilities has a succession program in the event I am unavailable to make timely transactions. Paula will also be a second set of eyes in an effort to step up audit efforts as required by SPE National.

Finally, I must send a big THANK YOU once again to all of our sponsors who have diligently supported the Automotive Division! Please let me know if you're interested in specific details of how our money is spent in support of education. And mark your calendars for our 2nd annual Sponsor Appreciation Event next December!

AS OF FEBRUARY 16, 2018, THE DIVISION'S ACCOUNT BALANCES WERE:

Checking:	\$530,057.72
Savings:	\$ 27,463.69
Total:	\$557,521.41

A promotional graphic for Abaris Training. At the top, a rainbow-colored bar spans the width. Below it, a sports car is shown in profile, with a vibrant rainbow gradient across its body. The background is a dark, checkered pattern. The text 'REV UP YOUR CARBON FIBER KNOWLEDGE' is written in large, bold, white letters. Below the car, the text 'All New Classes for 2018!' is in yellow, followed by 'ENGINEERING • MANUFACTURING • REPAIR • NDI' in white. At the bottom, the Abaris Training logo is displayed, consisting of the word 'ABARIS' in blue and 'TRAINING' in white on a blue arrow. Below the logo, the contact information '+1 (775) 827-6568 • www.abaris.com' is written in white.

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COUNCILOR'S REPORT

December 15, 2017 Council Meeting Minutes Teleconference

by Suresh Shah, SPE Automotive Div. Councilor

Opening Remarks & Declaration of Agenda

President Al-Zubi called for a moment of silence to pay tribute to recently deceased SPE members E. Clark Broome and Dick Nunn.

Al-Zubi called for a motion to approve the agenda. There were no objections.

Financial Update

- VP Finance Dworshak discussed 2017 fiscal results YTD.
- 4 major expenses items were highlighted: CEO search; membership; corporate sales; ANTEC '17.
- These items represent a loss of (\$600k).
- A new project accounting approach will be used in 2018, including ways to increase revenues through a renewed focus on corporate sales, membership services, and ANTEC profitability.
- The Wiley payment of \$1.5MM represents a 1-time increase in publications revenue. More in-depth details can be found on **Leadership Lane** where all EB presentations are posted.
- THE CHAIN ON SPE SITE - <http://thechain.4spe.org/home?navItemNumber=26934>
- THE LEADERSHIP LANE ON SPE SITE – <http://thechain.4spe.org/leadershiplane/home>

Election Review (S. Owens)

Past-president Scott Owens presented an overview of the upcoming election cycle and an explanation of the voting process. Complete details can be found in **Leadership Lane**.

NGAB (Next Generation Advisory Board) Report (S. Sanchez)

VP Sergio Sanchez reviewed 5 strategic objectives from the 2018 action plan for NGAB and the associated request for \$78k funding.

- Recruit 100 new Young Professional members
- Recruit and retain 10 new active NGAB members

- Identify / prepare chair-elect
- Retain 15 active, core NGAB members
- Take charge of Student Activities Chapter (SAC)

Councilor D. Cameron asked if the funding request had been fully vetted by the Executive Board. President Al-Zubi responded that EB had closely reviewed the request and approved the funds after discussion.

ANTEC Task Force (ATF) Report (J. Gomez)

- VP Jaime Gomez presented a summary of the ATF activities and noted that the new format was presented in draft format to EB on 12/14. Several councilors asked questions about the nature of the changes including deadlines for major decisions.
- VP Gomez stated that the task force had respected the fundamentals of ANTEC but will propose changes to the format to make it more exciting.
- The proposals will be available in Jan 2018.
- All councilors are requested to review the draft and provide feedback within 3-4 weeks with the March Council Meeting expected to be the date for a final decision to accept the changes with a formal announcement made at ANTEC 2018 in Orlando.
- The task force is targeting the 2019 event for implementation.

Sections Update (M. Verheij)

VP Monica Verheij made a motion that Council place 6 sections in abandoned status and motion carried.



MEMBERSHIP REPORT

Steven VanLoozen,
SPE Automotive Division Membership Chair

I would like to first thank everyone reading this for their ongoing support for SPE. Membership in the Automotive Division as of February 15 stands at 882. This time one year ago we had 936 members. Membership is critical to our success and directly supports our ability to provide the educational outreach and support for young professionals that will help ensure the next generation of leaders in our industry are prepared to inspire the automotive innovations only plastics and composites can provide.

Many of us are so busy we may have forgotten some of the valuable resources that are available to SPE members. I encourage everyone reading this to take a few moments to log on to www.4spe.org and browse the extensive library of technical resources and technical journals available to you as an SPE member. These resources are incredibly valuable and I encourage all of our members to take full advantage of them and encourage new engineers in our industry to research the value of membership in SPE.

One of the other great benefits of SPE are the events scheduled throughout the year providing an opportunity to network with the great professionals in our field. The newest of these events will be held on March 15th in celebration of March Madness! This Next Gen event is sponsored by the Detroit Section of SPE and will be held from 6 to 8PM at Hopcat in Royal Oak. The cost of the event is only \$15 and this includes drinks and appetizers. Please RSVP to Chelsea Barriga (cbarriga@chaseplastics.com) by March 12 if interested and we look forward to seeing you there.



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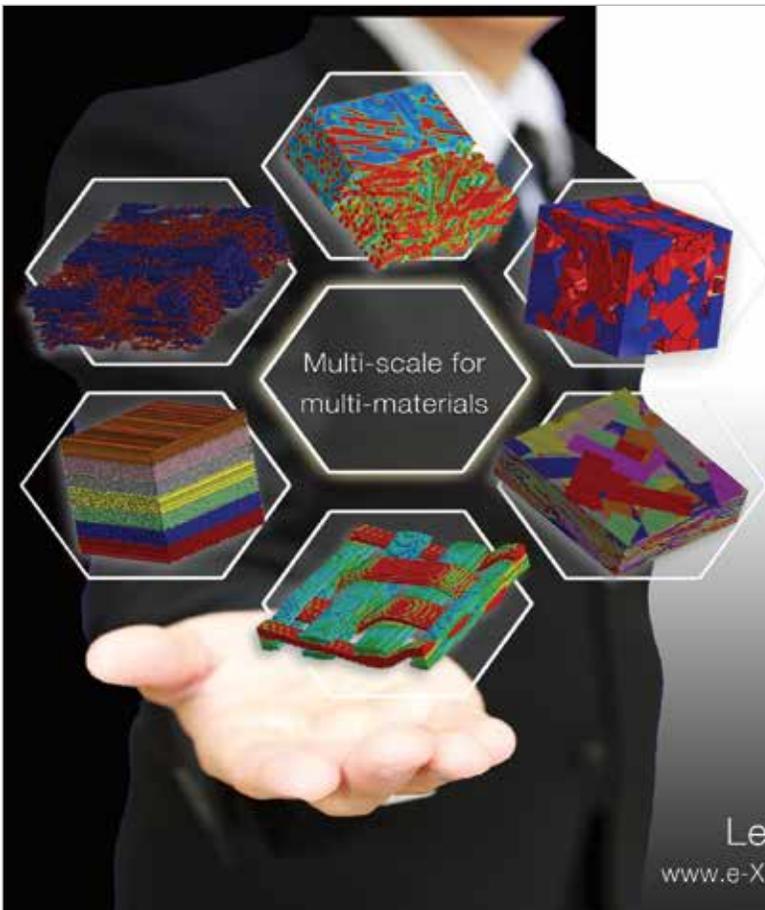
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Next Generation Advisory Board

Generating Leaders for the Society of Plastics Engineers



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You may have caught the article about SPE's Next Generation Advisory Board (NGAB) in the September issue of Plastics Engineering Magazine. If not, we are a group of young professionals and students who are focused on laying the future foundation for SPE and creating tomorrow's industry leaders.

Over the course of the past four years, NGAB has managed to grow from three members to a strong collective of 67. We hold monthly calls and plan activities for increased young professional engagement in SPE.



NGAB meeting at IMTECH, NGAB Cookout & Volleyball at IMTECH, NGAB Whirlyball Social at Annual Blow Molding Conference.

This year, we have begun to partner with Sections & Divisions to plan NGAB activities that are co-located with TopCons and other industry events, such as IMTECH and the Annual Blow Molding conference. These events have been effective in engaging the next generation of plastics professionals and have helped us strengthen and grow our core team.

If you are interested in joining NGAB, or partnering with us to for an event, please contact Mercedes Landazuri mlandazuri@apexcolors.com or Shankar Srinivasan srigshan@iastate.edu to learn more. You can also follow us on Facebook at www.facebook.com/NextGenAdvisoryBoard/

Best,

Mercedes Landazuri

Mercedes Landazuri
Chair, SPE Next Generation Advisory Board
Customer Relations, Apex Colors, Inc.

SPONSOR APPRECIATION

HOLIDAY EVENT HELD DECEMBER 6TH

48 SPE Automotive Division members attended our December 6th Board Meeting and Sponsor Appreciation Holiday Event at Ruth's Chris Steak House in Troy, and we had a great showing from OEMs and Sponsors, including SPE members from GM, Ford and Toyota as well as from DSM, EMS Grivory, Abaris, BASF, Autodesk, Moldex 3D, JSP, Techno Polymer America, Neutrex/Purgex, CSP Plastics/Toho Tenax, A. Schulman, Borealis, Albis, Sonoco, Ashland, Inteva Products, Grupo Antolin, The Materials Group, and more.

After the regularly scheduled board meeting from 5:30 pm – 6 pm, beverages and Hors d'Oeuvres were enjoyed from 6 pm – 8 pm as a way to thank sponsors for supporting our educational programs that nurture growth in the automotive plastics industry. As examples, our ACCE conference alone provided \$18,000 in scholarships this year (2017) and proceeds from our Golf Outing – arguably our most fun event - are supporting eight SPE student chapters at Michigan universities.

The SPE Automotive Division is very grateful for the support of our sponsors. The food was great! And so were the beverages (and chocolates) :).

Thank you!



*Tom Pickett, GM;
Mark Lapain, Magna*



*The DSM crew: Paula Kruger,
Keith Siopes, Jacob Jones, Jiang Zhu*



*Dan Dowdall, Ashland; David Denzel, Purgex;
Rhonda Denzel, Purgex; Andrew Rich, A.Schulman*



AUTOMOTIVE



Matt Carroll, GM; Teri Chouinard, Intuit Group; Suzanne Cole, Miller Cole; Kevin Pageau, IMA



Chuck Jarrett, TMG; Glenn Cannavo, DSM; Josh McIlvaine, DuPont



Jeff Higgins, Doug Muzzio & Doug Mandic, AutoDesk



Anthony Gasbarro, Marubeni; Mike Cantore, Techno Polymers; Kris Horton, Marubeni



Teri Chouinard, Intuit Group; Norm Kakarala, Retired - Inteva; Dave Helmer, GM; Dhanendra Nagawanshi, SABIC; Crystal Van Houten, Grupo Antolin



Bill White, Abaris; Suresh Shah, Retired - Delphi; Umesh Gandhi, Toyota; Mo Mahmood, Consultant;



Joe Michelich, JSP; Cynthia Flanigan, Ford



Douglass Thornhill & Amber Schulte, EMS-Grivory; Matt Remenar, Toho Tenax / CSP; Crystal Van Houten, Grupo Antolin



Thank You



SECRETARY'S REPORT

SPE Automotive Division Board
February 12th, 2018 Meeting Minutes



ATTENDEES

Crystal VanHouten,	Dave Helmer,	Gary Kogowski,	Bonnie Bennyhoff,	<i>Ph: Bd Luibrand,</i>
Matt Carroll,	Norm Kakarala,	Jay Qizilbash,	Nippani Rao,	<i>Rose Petrella,</i>
Tom Pickett,	Suresh Shah,	Dave Reed,	Suzanne Cole,	<i>Marc Bahm</i>
Dhanendra Nagwanshi,	Fred Deans,	Al Murray,	Paula Kruger,	
Alper Kiziltas,	Steve Van Loozen,	Jeff Helms,	Samar Teli,	

Meeting was held at the ACC (American Chemistry Council) in Troy, 5:32pm – 7:26pm

OPENING – Matt Carroll

Review of Agenda for Meeting.

FINANCIAL – Bonnie Bennyhoff

Welcome new financial assistant, Paula Kruger of DSM! Balance sheet reviewed. Everything is on track and we are in good financial position. Division goal is to increase our outreach spending \$40,000. Financial year to date we have total assets of \$548,543.66. Bonnie compared assets 2017 vs 2018.

COUNCILOR REPORT – Suresh Shah

December meeting held via teleconference. During the call, a financial update was provided, the upcoming election reviewed, NGAB reviewed 5 strategic objectives, some by-laws and policies were updated and other pertinent information was reviewed relating to ANTEC and other sections. A full report of the minutes from the meeting can be found on The Chain, Leadership Lane Library.

Next Councilor meeting will be a teleconference and then followed by a face to face meeting at ANTEC.

WEBSITE ANALYTICS – Mark Bahm

Marc is training Suzy Meeks (Ohio State Grad) to assist with website work, as needed. 1/10/2018 to 2/10/2018 analytics showed 300 hits a day. Analytics are reviewed monthly but have the ability to look at longer time frames. Question was raised on how to track newsletter downloads. Marc proposed that we require a login and password for Newsletter access. Another idea was to at least get an email address that Membership could follow-up on. Will discuss in April, when we have more details on how many people download newsletters.

2018 ACCE REPORT – Alper Kiziltas & Matt Carroll

Several press releases and call for papers have been sent out already. Behind on papers. 17 abstracts submitted. Deadline for abstracts extended to April 130, 2018. Paper deadline is June 15th. Sponsorship to date is \$258,950.

DESIGN IN PLASTICS - The MAIN Event – Matt Carroll

Co-Chairs: Steve Van Loozen and Chuck Jarrett organized and attended prep meetings.

Matt Carroll and Chuck attended the presentations and voting on December 13th. Great support from Ford Design Director, Head of Dodge and SRT Design, and LTU Professor.

Proposal to increase funding from \$15,000 to \$20,000, allocating \$10,000 to the event and the other \$10,000 to student scholarships.

Motion made, motion passed with all in favor.

Recommendation that SPE and LTU look into a plastics course or seminar held on designing with plastics. Also, can we start an SPE Student Chapter with LTU?

EDUCATION – Alper Kiziltas & Fred Deans

SPE Automotive Division committed to fund 20 PlastiVan Visits at \$31,500. 9 have occurred this year already. Discussed the interest and need for schools asking for 3D printers. Nice printers are available from \$1,000 to \$20,000 that we could buy and donate possibly. Further discussion tabled until April meeting. The Division would like to understand the school's curriculums and the focus on 3D printing. Are there any matching organizations such as the NSF?

Golf outing proceeds are being donated to 8 SPE Student chapters. Motion made to increase funds from \$625 to \$1000 for each student chapter. Motion passed. A member of the Automotive Division will personally deliver the checks to a student SPE Meeting. Matt Carroll will send the SPE "Who We Are and What We Do" presentations to the volunteers. We will be asking each Student Chapter "how will you spend the money?"

NEWSLETTER – Dave Helmer

Planned to print 1100 newsletters (prior 1300). 1100 would still be about 100 extra. Article submission deadline for the next Newsletter is 2/16/2018. Open space available for article submission.

Minutes



CHAIR REPORT – Matt Carroll

Pinnacle Award submitted on time. Taxes to be filed by mid-March 2018. Jeff Helms was nominated for HSM (Honored Service Member). Schedule of Events, the 2017/2018 SPE Automotive Executive Committee, Committee Chairs, and Board of Directors was updated and will be voted on in April.

Schedule of Events

- April 9th, 2018 Auto Board Meeting
- June 11th, 2018 Auto Board Meeting

ANTEC – Matt Carroll

ANTEC is May 7-10, 2018, in Orlando, Florida. Attending this year from the Automotive Division are Norm Kakarala, Tom Pickett, Matt Carroll and Suresh Shah. Other division members will be there as speakers, including Paula Kruger and Josh McIlvaine. ANTEC Co- TPC Chairs for Automotive are Norm Kakarala & Tom Pickett. Helping Norm & Tom review the technical papers was Suresh Shah. 23 presentations which is the most ever for ANTEC Automotive. Scheduled in the following 3 sessions.

- Materials Development on Wednesday, May 9th from 8:00 to 11:30 am.
- Design & Applications on Thursday, May 10th from 8:00 to 11:30 am. Keynote Speaker Michael Ruby will talk on “Intelligent Automotive Design with Plastics”.
- Process & Simulations on Thursday, May 10th from 1:30 to 6:00 pm.
- Following the technical presentations will be the Automotive Division Business Meeting May 10th at 6:00 to 6:30 pm.

There will be a Plastics for Life Global Parts Competition. Jeff Helms has submitted winners from the Automotive Innovations Awards and will again submit the maximum five nominations. There will also be the Plastic Race. Motion made to sponsor the Plastics Race and NGAB \$5,000 to become a Bronze sponsor. Motion passed, no objection made.

AUTOEPCON - Gary Kogowski

2018 Auto EPCON will be Extended to a 1.5 Day Conference. Keynotes have been established. 5 committed sponsors.

IAG – Jeff Helms

Reviewed 2017 IAG financials. 2018 Program theme is “Plastics-Enabling Global Automotive Design”. To be held at Burton Manor on November 7th, 2018. BoD first round judging to begin September 27-28th, followed by Blue Ribbon Judging on October 5th, 2018. Suzanne Cole mentioned that she will visit OEMs along with Kevin Pageau and Teri Chouinard to help with nominations.

INTERSOCIETY REPORT – Dhanendra Nagwanshi

Possible collaboration for a February, or later in the year. More details to come as they are available.

NEW BUSINESS

Promotion of Next Gen Advisory Board Networking Event being held in conjunction with the Detroit SPE Chapter. The event will take place in Royal Oak, at HopCat from 6pm-8pm on Thursday, March 15th, 2018.

The team discussed the possibilities of holding a “Plastics in Autonomous and Electric Vehicles” TopCon. Discussion tabled until next time.

Meeting adjourned.



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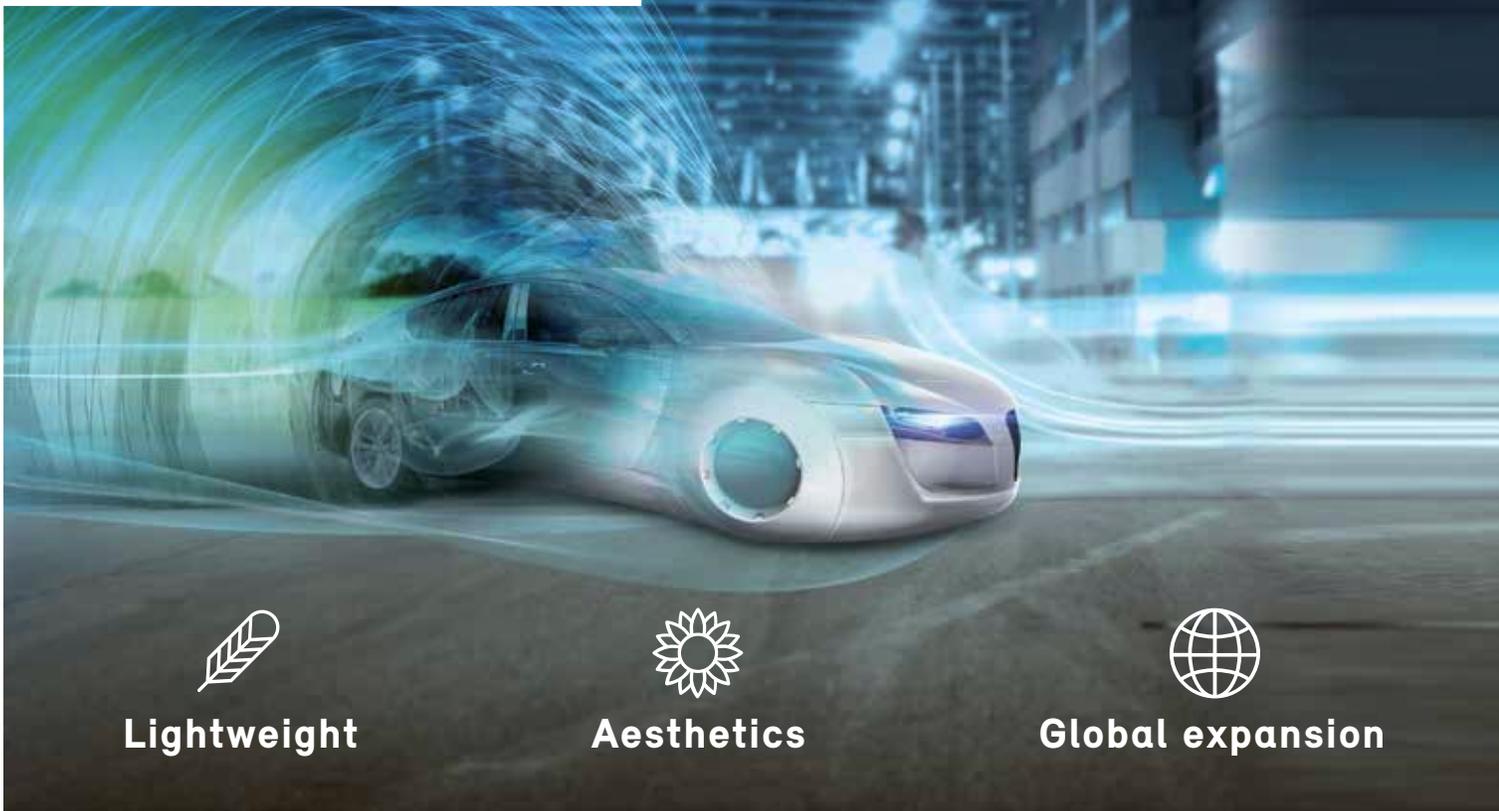
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Technical Report

Carbon Fiber Composite B-Pillar Reinforcement Manufacturing: Ply Nesting and Automated Ply Layup

Jeff Dahl*, Matthew Rebandt, Michael Cacovic,
Ford Motor Company

Abstract

To reduce vehicle mass and increase fuel efficiency, carbon fiber composites are being considered for structural body components. As a demonstrator, a B-Pillar reinforcement was designed with continuous carbon fiber prepreg as the material system. Based upon structural analysis and subsequent ply layup determination, a tri-axial non-crimped fabric (NCF) was selected as the base fiber architecture so achieving a high material utilization was critical for cost effective manufacturing. Two dimensional ply nesting software was used to optimize material utilization and simulate ply cutting time for individual plies. Following ply cutting, automated ply layup is a required processing step for fully automated manufacturing of carbon fiber composites. The experimental effort presented was focused on the ultrasonic welding of thermoset prepreps during automated ply layup. Additionally, predictive models were developed based upon experimental data and will be presented.

Background and Requirements

Carbon fiber prepreg can be manufactured using a variety of fabric architectures including braided, woven and non-crimped fabrics (NCF) along with unstitched or stitched unidirectional fibers. In general terms, each fabric architecture type will yield equivalent structural performance in the composite. However, each fabric type will exhibit different characteristics throughout the manufacturing process which must be taken into consideration.

To investigate the applicability of continuous carbon fiber composites in a structural application, a B-Pillar reinforcement was designed. Structural analysis of the B-pillar under side impact and roof crush loads was conducted and the ply layup was determined to be $[(0,60,-60)ncf/(-60,60,0)ncf]_3$. It was then necessary to perform a manufacturing feasibility study on the fabric architecture relative to two dimensional ply cutting. The main areas of interest in this step of the manufacturing process are material utilization and ply cutting cycle time for input to cost modeling activities. Material cost is generally the largest component of the overall cost when using carbon fiber composites. Hence, maximizing material utilization is paramount. To optimize material utilization, AGFM's NS2 nesting software [1] was used to generate two dimensional ply nests and the resultant ply cutting times. An American GFM CM10 Dynamic machine was selected to be used for the study, because it has a lower capital cost, and higher cutting speed when compared to their other machines.

For implementation of carbon fiber composites in automated manufacturing, methods are required and processing parameters must be well defined for repeatable and robust processes. Automated ply layup is one processing step for fully automated manufacturing of carbon fiber composites. The cell used consists of nesting tables for ply placement, an ultrasonic welding unit to weld prepreg plies together in the desired ply layup and a robot for required pick and place operations. Welding of thermoset prepreg plies is an enabler for automated robotic handling of ply layups.



JEFFREY S. DAHL

Jeff is a Technical Expert in the Composites Group, Structures and Stamping Department of Ford's Research and Advanced Engineering division. Jeff has worked for the Ford Motor Company in the area of composite materials for the past 23 years. He is involved in developing composite materials and related manufacturing processes for high volume automotive applications using both thermoset and thermoplastic composites. Mr. Dahl worked on the establishment of the first Programmable Powered Preforming Process (P4) machine in the United States for the Automotive Composites Consortium. He has also implemented robotic preforming and resin transfer molding technology for 13 structural, semi-structural and Class 'A' components on the Aston Martin Vanquish, DB9 and V8 Vantage. His work has also included development of both continuous and discontinuous glass and carbon fiber composites for use in compression molding. Jeff has published numerous papers in the area of automotive composites and has been granted nine U.S. and international patents.

He graduated summa cum laude in 1995 from Winona State University in Winona, Minnesota with a BS degree in Composite Materials Engineering.

Nesting Simulations

The two dimensional geometry of the carbon fiber composite B-pillar reinforcement is determined from the three dimensional model. The three dimension model is imported into Siemens Fibersim software to create the two dimensional blank geometries based upon material type via the forming simulation. To optimize material utilization, AGFM's NS2 nesting software was used to generate two dimensional ply nests and the resultant ply cutting times.



Figure 1: American GFM ultra sonic cutter CM10 machine, used to cut composite prepreg.

Because of the fiber architectures under consideration, the tri-axial NCF is required as three plies contained within the NCF (-60/0/60). The two 0° plies specified [-60/02/60]2s are combined into one ply of twice the areal mass to minimize complexity. Since off-axis fibers are contained within the NCF, only one ply blank type is required. In order to create a symmetric laminate, however, two different rolls of material are required (-60/0/60 and 60/0/-60).

In order to form and trim the part in a repeatable fashion, the original blank geometry obtained via Fibersim was increased. The increase in size is required to hold the blank during forming, thereby preventing wrinkling or over stretching the fiber and ensuring that the entire perimeter is beyond the edge of part. The additional material is trimmed during preforming process creating a net shape component for compression molding.

The additional material also allows the expanded blank geometry profile to be optimized to increase cutting speed and reduce cycle time. Tight radii, corners and rough lines were modified to create smooth tangent transitions along the cutting path. This also allowed for a continuous path versus having to start and stop and move the head up and down to start new cuts. By eliminating unnecessary movements, the cutting time was decreased from 73.2 seconds to 5.4 seconds a ply, improving the cutting cycle time 1,356.6%. With these changes the cutting length was unaffected and the surface area was increased by less than 0.01%.

The modified, two dimensional ply was imported into the NS2 Nesting System [1] software to optimize material utilization and determine ply cutting cycle time. Fiber orientation, the number of plies required, roll width,

machine type and the size of the cutting machine were all accounted for within the software. With these constraints, the software optimized material utilization and provided an estimated cutting cycle time based upon the cutting machine kinematics. Due to the fiber angles specified in the ply layup and the NCF architecture, only a 180° rotation of the plies could be performed during nesting to improve utilization while maintaining the specified fiber orientations in the B-Pillar reinforcement.

The CM10 Dynamic ply cutting machine featured an automated material unrolling system that feeds material off of the roll and into the cutting window. After material in the cutting table window was cut, the conveyor dispensed additional material into the cutting window. The conveyORIZED material dispensing system moves at 115 mm/s. This transfer rate was applied to each material nest to determine the time for each length of material required to be unrolled. The reported ply cutting time was the time for the ply to be cut plus the time for the conveyor to unroll the material.

Carbon fiber NCF materials and subsequent prepregs both have width limitations based upon existing manufacturing equipment. NCF manufacturing is typically limited to 2540 mm wide based on supply base capabilities. Additionally, prepreg manufacture is typically limited to 1500 mm. Because of the different constraints, a NCF fabric can be manufactured larger than the prepreg limitations and then slit prior to winding. This allows twice the fabric throughput from the same machine; hence, this option was examined as it will affect overall manufacturing costs. Two different roll widths were then considered for nesting studies. The first having a fabric that is slit before prepregging and the second being a material limited by the prepregging process.

Due to the geometry of the B-pillar preform when nested, it has a higher utilization when paired together along the width of the material and alternating in direction by 180°. To achieve the highest utilization, the plies were nested as an even number across the width. The maximum widths for the NCF are 1270 mm for the slit roll or 1500 mm for prepreg manufacturing. With these limiting dimensions, a maximum of four (4) plies could be nested across a 1270 mm roll, whereas a maximum of six (6) plies could be nested across a 1500 mm roll. A partial nest example for the four ply width assumption is given in Figure 2. Using these constraints, nesting simulations to determine the highest possible material utilization were conducted.

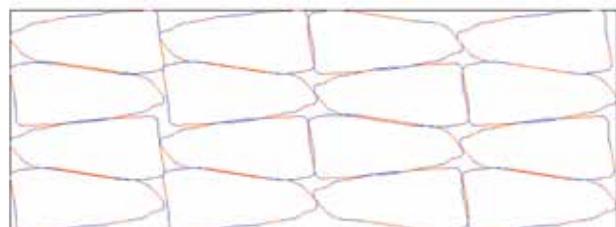


Figure 2: Nest of b-pillar with 4 plies across.

Results

Four Ply Width Nest Scenario

In the four ply width nest scenario shown in Figure 2, five different nest sizes were investigated (4, 8, 12, 16 and 20 plies) with each nest being a multiple of the original four ply width assumption. The highest material utilization for the four (4) ply nest was at a roll width of 997 mm. The highest utilization for the eight (8) and 12 ply nests was with a 1008 mm wide roll. For both the 16 and 20 ply nests, the highest material utilization was achieved with a roll width of 999 mm. The 20 ply nest at a roll width of 999 mm yielded the highest material utilization of 87.2%.

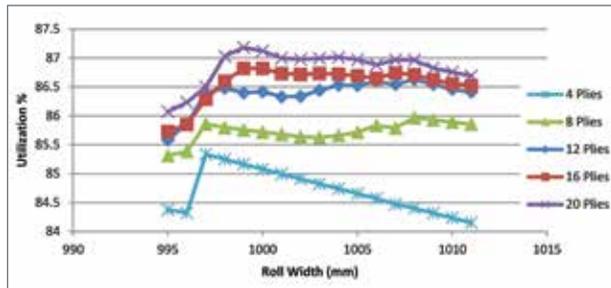


Figure 3: Material utilization versus roll width, four ply width nest scenario

Not surprisingly, material utilization was increased with an increased number of plies in the nest. Examining the 16 and 20 ply nests, material utilization increased from 86.8 to 87.2% with only four additional plies. It is then obvious that nests containing more plies should be examined to determine the effect on material utilization. However, execution time for the analysis increased with the ply count, due to limited software and computing and the 20 ply nest was the largest that was analyzed. An optimum nest to yield the highest material utilization at a roll length of 150 meters could not be determined.

Six Ply Width Nest Scenario

For the six ply width nest scenario, three different nest sizes were investigated (6, 12 and 18 plies) with each nest being a multiple of the original six ply width assumption. The highest material utilization of 88.1% was achieved at a roll width of 1482 mm. As expected, this was achieved with the largest nest, the 18 ply nest. In this instance, material utilization increased by 0.6% when increasing the nest size from 12 to 18 plies. Again, software and computing power limited the maximum nest size to 18 plies.

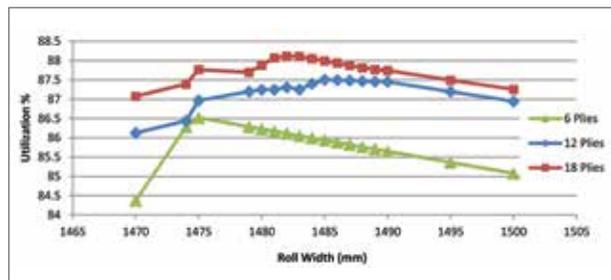


Figure 4: Material utilization versus roll width, six ply width nest scenario.

Long Nest Computing Issues

Due to limitations of computer processing, an optimum nest to yield the highest material utilization at a roll length of 150 meters could not be determined. To be sure, repeated attempts to analyze a 24 ply nest in the four ply width nest scenario returned material utilization values lower than the 20 ply nest. This was despite an additional 13 hours of computational time (5 versus 18 hours). Similar issues were encountered with the six ply width nests.

Four Ply Width, Long Nest Scenario

Three different four ply wide nests were used to determine material utilization off of a 150 meter long roll. These were a 16 ply nest, a 20 ply nest and also a 16 ply nest created from the 20 ply nest. In the last instance, the last four plies were removed from the 20 ply nest to create another alternative. This was done to generate a 16 ply nest which could be rotated 180° thereby creating a different nest pattern and more options for optimizing material utilization. Material utilization versus roll width displayed data for the three ply nests examined are graphically displayed in Figure 5.

A long nest of the 16 ply nest generated from the 20 ply nest yielded the highest material utilization at 88.1%. The roll width was 999 mm. This result is 0.9% higher than the utilization determined for a single 20 ply nest in the first analysis. Both long nests from the 16 and 20 ply nests yielded slightly lower material utilization at 87.4 and 87.9%, respectively. It is believed that this is due to the rotational ability of the 16 ply nest generated from the 20 ply nest to create a different pattern. In the case of the other two nests examined, a 180° rotation created the same nest.

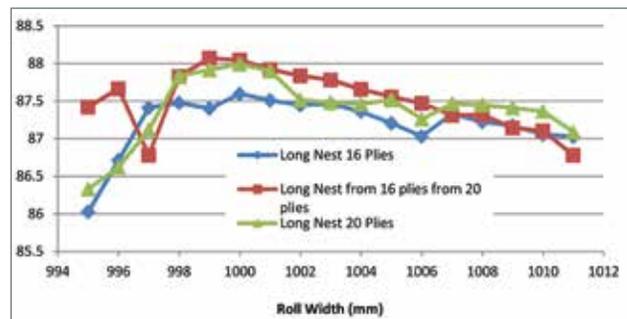


Figure 5: Four ply width long nest results, utilization versus roll width, roll length of 150 meters

Six Ply Width, Long Nest Scenario

The previously developed 12 and 18 ply nests were nested to a maximum length of 150 meters at various roll widths (Figure 6) to determine the maximum material utilization. The 12 ply nest yielded a higher material utilization than the 18 ply nest at 89.1 versus 88.9% both at a roll width of 1480 mm. This was a 1.0% increase in material utilization versus the single 18 ply nest results. As seen in the four ply width long nest results, this was more than likely due to the fact that the 12 ply nest can be rotated 180° creating a different pattern. This allowed for more nesting options to increase density and thus utilization. In the case of the 18 ply nest,

the nest was the same when rotated allowing for fewer nesting options. The rotational capability was evident by examining both ply nests.

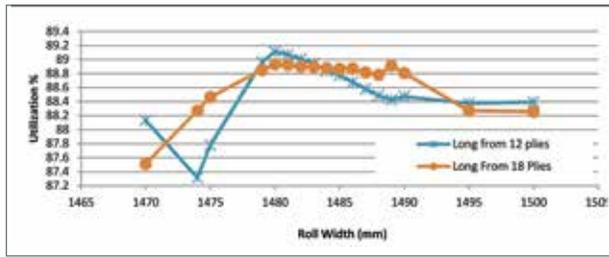


Figure 6: Six ply width long nest results, utilization versus roll width, roll length of 150 meters

Data Summary

The analysis results for both ply width scenarios are summarized in Table I. To accommodate the tolerance of the automated edge guiding system as well as the profiling tolerance of the cutting machine, an additional 10 mm was added to the optimum material width. This reduced material utilization determined via the nesting software but the extra width cannot be included as it would affect the nesting. The preform ply utilization was the two dimensional utilization directly from the roll.

With a four ply width nest, the highest material utilization of 87.2% was found at a roll width of 1009 mm. The cycle time per part was 44.8 seconds. With a six ply width nest, the highest material utilization of 88.5% was found at a roll width of 1490 mm and the cycle time per part was 41.6 seconds. The optimum six ply width nest yielded a 1.3% improvement in material utilization and a 3.2 second per part cycle time improvement versus the optimum four ply width nest.

Table I: Four plies wide vs six plies wide prepreg

	4 ply width		6 ply width	
	Short Nest	Long Nest	Short Nest	Long Nest
Roll width (mm)	1009	1009	1492	1490
Length (mm)	3427	149286	2057	149388
Preform ply utilization (%)	86.3	87.2	87.5	88.5
Time per ply (s)	7.6	7.5	7.1	6.9
Time per part (s)	45.8	44.8	42.6	41.6

Ultrasonic Welding Development

Manufacturing viability of a high volume automated system will include successful development of cutting, blank handling, ply layup with ultrasonic stitching, preforming, and molding of a carbon fiber composite material system. The thrust area detailed below is for ultrasonic stitching of a carbon fiber thermosetting resin prepreg system. The development of an ultrasonic stitching process has two prime objectives; to develop ultrasonic stitching process parameters that will exhibit sufficient strength for automated handling of the ply layouts and to develop and optimize ultrasonic welding parameters for ply layup configurations that will produce stitching capabilities with no horn interface sticking and no advancement in the resin material cure kinetics.

For successful implementation of carbon fiber composites in automotive components, automated manufacturing methods are required and processing parameters must be well defined for repeatable and robust processes. Figure 7, shows an automated manufacturing cell for carbon fiber composites. The cell consists of nesting tables for ply placement, an ultrasonic welding unit to weld prepreg plies together and a robot for required pick and place operations.

This work expands on previous efforts that scoped down and narrowed in on the ultrasonic inputs and parameters by incorporating a quantitative measurement of weld strength and predictive models based upon experimental results. Additionally, the effect of process variables on weld energy was also explored. The results generated will be used to further optimize the ultrasonic welding of thermoset prepregs to achieve welds suitable for automated robotic handling of ply layouts.



Figure 7: Automation cell performing pick and place operation, onto an ultrasonic unit.

An ultrasonic stitch machine was designed with an acoustic titanium horn to ultrasonically stitch the prepreg plies for a specified ply layout. The power supply transfers a high frequency vibrational energy from the horn to the thermosetting prepreg on contact. The energy induced from the ultrasonic system is converted to heat through friction, which tacks the prepreg layers together and forms a stitch to create the ply layout stack. The unit implemented to demonstrate prepreg stitching was the Branson model 2000Xeat20:40.0.

The material system used for ultrasonic welding trials was a thermosetting carbon fiber prepreg, consisting of Dow P6300 prepreg material (2x2 Twill). Weld strength characterization was conducted using ASTM D5868 [3] as a guideline. Due to the horn size, standard lap shear specimens were not feasible and fabric grippers caused buckling and misalignment of the specimens when loaded. A new test fixture was designed, fabricated, and assembled to perform the tests on to eliminate these issues. Prepreg samples were cut to size and a two-layer weld was performed accordingly.

Results

A designed experiment, was developed to examine four factors when welding thermoset prepregs (Table II). Hold time was held constant at two seconds. Weld strength and energy were examined as experimental responses. For each

experimental run, a total of 5 specimens were tested and sample means calculated for data analysis. All significance testing was performed at the 95% confidence interval.

Table II: 2-level, full factorial

Factor	-	+
Amplitude (%)	30	40
Weld Time (s)	0.4	0.7
Weld Air Pressure (psi)	30	100
Trigger Pressure (psi)	1	25

The main and interaction effects plots for weld strength are given in Figures 8 and 9. All four factors were determined to be significant with respect to weld strength. Weld time and amplitude had the largest effect with respect to weld strength. With a high weld time setting, the mean shear strength was 3.0 kN whereas with a low weld time setting the mean shear strength was 1.5 kN. Amplitude was nearly as significant with weld strengths of 2.9 versus 1.6 kN for the high and low data means, respectively. The effect of air pressure and trigger pressure, although statistically significant, was much less than weld time or amplitude which is clearly evident from the main effects plot. Three, two-way interactions were also determined to be significant with respect to weld strength. Trigger pressure-air pressure was found to be the most significant two way interaction and that of weld time-amplitude and amplitude-trigger pressure being the least significant.

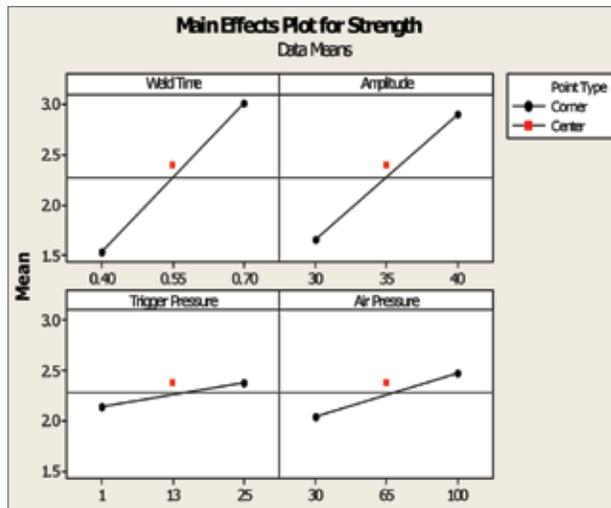


Figure 8: Main effects plot, weld strength

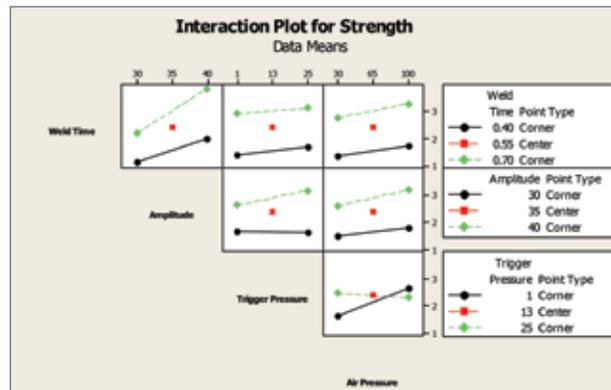


Figure 9: Interaction effects plot, weld strength

The main and interaction effects plots for weld energy are given in Figures 10 and 11. As with weld strength, all four main factors were determined to be significant with respect to weld energy. Weld time and amplitude were the most significant with differences between the data means of 425 and 310 J, respectively. The two way interactions of weld time-amplitude and trigger pressure-air pressure were also found to be significant. An analysis of variance determined that 95% of variation could be attributed to the main effects and 4% to the two way interactions with the remainder being residual error.

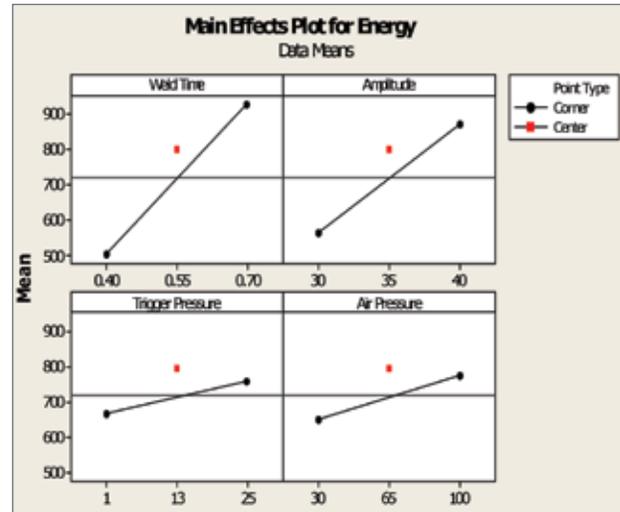


Figure 10: Main effects plot, weld energy

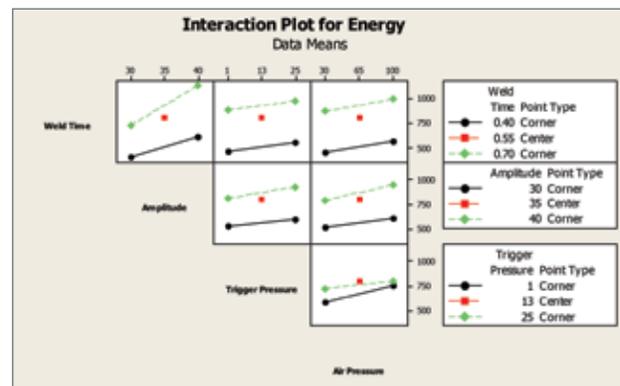


Figure 11: Interaction effects plot, weld energy

Subsequent to the above analysis it was indicated by the manufacture that the downspeed of the horn affected the rate of force build up on the prepreg. It was believed that this could affect energy transfer to the material and subsequently weld strength. To investigate this, an experiment was conducted, was a 2-level factorial at a half fraction design as shown in Table III. Parameters for the previous four factors were not altered and hold time was held constant at two seconds. Again, both weld strength and weld energy were analyzed as experimental responses. Five specimens were tested for each run to determine weld strength. All significance testing was performed at the 95% confidence interval.

Table III: 2-level factorial, 1/2 fraction design

Factor	-	+
Amplitude (%)	30	40
Weld Time (s)	0.4	0.7
Weld Air Pressure (psi)	30	100
Trigger Pressure (psi)	1	25
Downspeed	25	100

All five factors were determined to be significant with respect to weld shear strength. Again, weld time and amplitude had the largest effect as evidenced in Figure 12. Trigger pressure and air pressure were again significant, albeit at a lower level than weld time and amplitude. As for downspeed, the slope for the data means was the smallest and least significant with regard to strength for both the main and interaction effects.

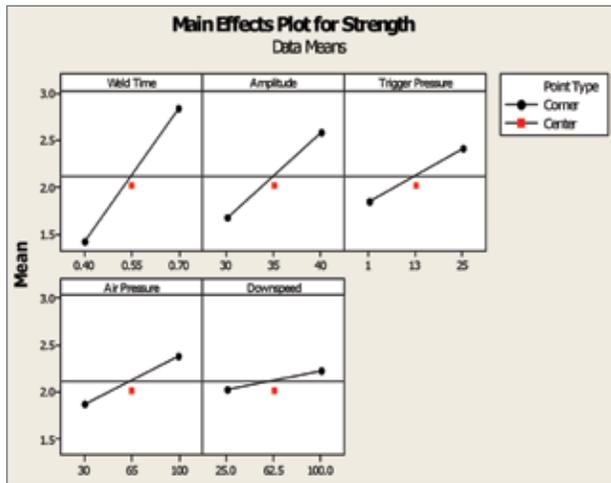


Figure 12: Main effects plot, weld strength

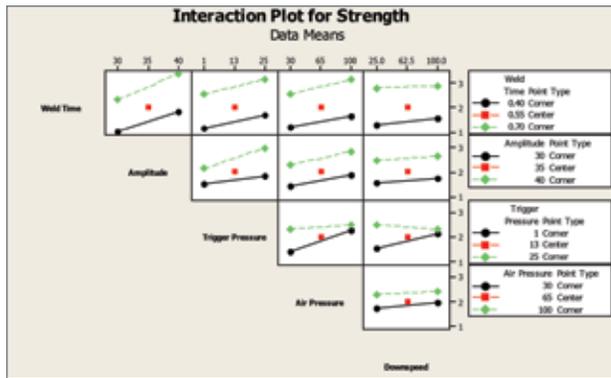


Figure 13: Interaction effects plot, weld strength

Three, two way interaction effects were determined to be significant as well. Trigger pressure-downspeed was the most significant two way interaction. Trigger pressure-air pressure and amplitude-trigger pressure were determined to have slightly less effect (Figures 13 and 14).

These significant effects are different than those relative to weld strength. This can be attributed to the addition of downspeed as a factor as both downspeed and the interaction of trigger pressure-downspeed were determined to be significant (Figure 14). Based upon the experimental data, a predictive model for weld strength was developed. The R²(adj) value was found to be 97.91% indicating good

agreement between the model and experimental data. The R²-(pred) value was 94.93% suggesting reasonable predictive capability within the experimental bounds.

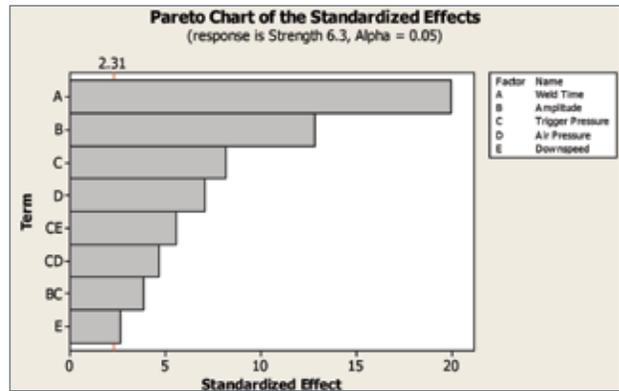


Figure 14: Pareto chart of significant effects, weld strength

The main and interaction effects plots for weld energy are given in Figures 15 and 16. Four of the five main factors were determined to have a significant effect on weld energy with downspeed being the only insignificant factor. As in the previous experiment, weld time and amplitude had the most significant effect with both trigger pressure and air pressure being less significant (Figure 14). The two way interactions of weld time-amplitude and trigger pressure-air pressure were also found to be significant.

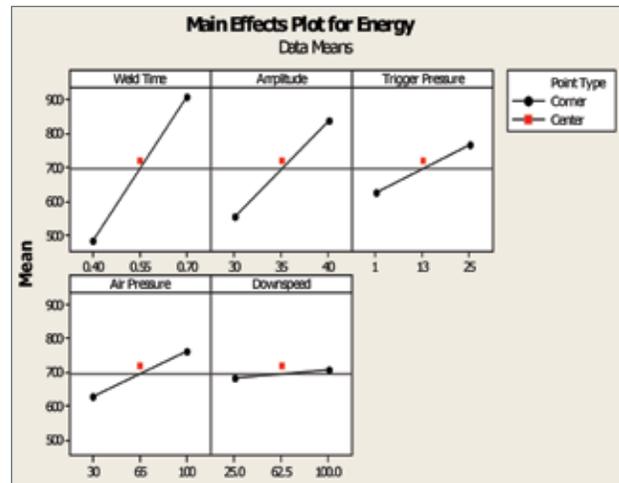


Figure 15: Main effects plot, weld energy

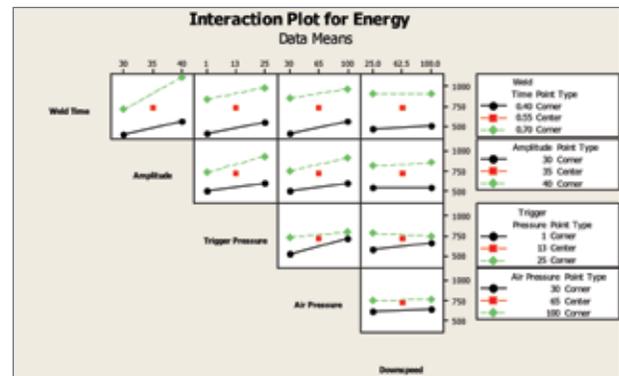


Figure 16: Interaction effects plot, weld energy

An analysis of variance determined that 92% of variation could be attributed to the main effects and 6% to the two way interactions with the remainder being residual error. These results are consistent with the other findings, despite the addition of downspeed as an experimental factor. With a R^2 -(adj) value of 95.74%, the model fits well to the experimental data. However, the R^2 -(pred) value was 91.77% indicating reasonable predictive capability within the experimental space. It is believed that completion of this experiment from a half fraction to full fraction factorial could improve the model and thus the predictive capability by generating data for the entire design space.

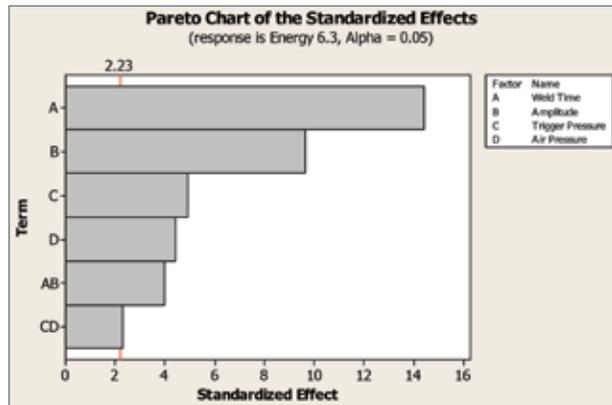


Figure 17: Pareto chart of significant effects, weld energy

Differential Scanning Calorimetry

It is essential that all local ultrasonic welds do not induce any epoxy resin curing. Differential Scanning Calorimetry (DSC) tests were run with a virgin epoxy resin system, epoxy with an ultrasonic weld energy of 200 J, and epoxy with an ultrasonic weld energy of 2000 J. To understand the response of the cure kinetics within the prepreg system, it was ideal to measure the minimum and maximum energy bounds within the ultrasonic process. All three resin tests outputted an enthalpy value of 57 J/g. In summary, no resin curing was recognized on the ultrasonically stitched prepreg plies.

Summary and Next Steps

Two dimensional ply nesting software was used to optimize material utilization and simulate ply cutting time for individual plies, thereby determining the most efficient manufacturing options. Optimal roll widths were established upon both fabric and prepreg manufacturing constraints. Based upon the trimmed ply utilization data, opportunities exist to further improve material utilization if the additional material required for preforming can be reduced.

Although an optimum roll width yielding the highest material utilization and shortest cycle time per ply was determined via two dimensional nesting analyses, this may not be the most cost effective solution for the complete component. As these results contain certain upstream and downstream manufacturing assumptions, the cost of other processes including fabric manufacture and prepregging may be affected. Hence, both scenarios must be examined

in the overall cost of the B-Pillar reinforcement.

While a solution was found to alleviate computational limitations which led to increased material utilization, this was not the optimal approach. It was not known if this approach determined the true maximum as a single ply was not used but rather an existing nest containing a given number of plies. Both the rotational ability of a nest or lack thereof seems to further support the concern of obtaining the true maximum. This issue requires further investigation to ensure that maximum material utilization can be achieved when using high cost input materials such as carbon fiber prepreg.

Using thermosetting carbon fiber prepreg materials, designed experiments were conducted to understand the effects of ultrasonic welding input variables on the weld energy and lap shear strength. The weld time and amplitude were determined to be most significant factors with respect to both weld strength and weld energy in both designed experiments. Similarly, trigger pressure and air pressure were found to be significant factors in both experiments with respect to both weld strength and weld energy albeit at lower significance. Downspeed and its interaction with trigger pressure were found to be significant effects with respect to weld strength but not with respect to weld energy. Predictive models were developed for both weld strength and weld energy with good agreement to experimental data and reasonable predictive capability

Ultrasonic welding of thermoset prepreps can be affected by material changes and additional designed experiments must be conducted to validate input parameters for new material formulations. Areal mass differences may alter the output window as energy differences may vary and strength may be compromised due to the prepreg collapse differences. Previous welding experiments were conducted with a 254 x 13 mm horn but the B-Pillar reinforcement plies will require a smaller horn for full contact on the prepreg stack. With this reduced horn size, scaling procedures for the current input parameters must be developed and validated. Along with different prepreg systems and horn size changes, the affect of ply layup must also be investigated. The B-Pillar layup requires additional plies versus the two ply stack seen in the experimentation detailed in this report. Each additional prepreg layer beyond a 2-layer stack may affect the force build-up, collapse depth, and subsequently the weld strength of the completed welded stack.

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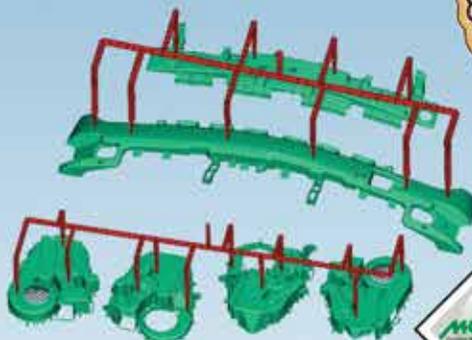
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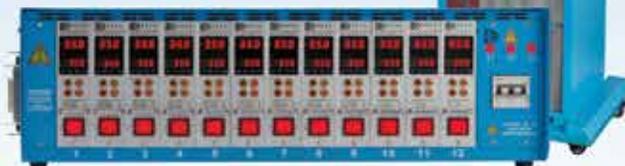
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