



Automotive Plastics NEWS

JUNE 2017 VOLUME 46, ISSUE 4



SPE® ANNOUNCES CALL FOR NOMINATIONS FOR 47TH-ANNUAL AUTOMOTIVE INNOVATION AWARDS COMPETITION & GALA

The Automotive Division of the Society of Plastics Engineers (SPE®) is announcing a "Call for Nominations" for its 47th-annual *Automotive Innovation Awards Gala*, the oldest and largest recognition event in the automotive and plastics industries, and due dates for the event's annual *Parts Competition*. This year's Awards Gala will be held Wednesday, **November 8, 2017** at the Burton Manor in Livonia, Mich. Winning part nominations (due by **September 13, 2017**) in 9 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, will be honored with a "Hall of Fame" award.



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NOVEMBER 8
2017



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AUTOMOTIVE DIVISION MEETING SCHEDULE & SPECIAL EVENTS CALENDAR

SPE Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. 5:30 - 7:30 p.m.
Troy, MI USA June 12, 2017

ACCE Abstracts Deadline

June 15, 2017

ACCE Papers Deadline

July 15, 2017

SPE Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. 5:30 - 7:30 p.m.
Troy, MI USA August 14, 2017

SPE Auto. Div. Golf Outing

Fieldstone Golf Club ALL DAY
Auburn Hills, MI USA September 5, 2017

17th-Annual SPE Automotive Composites Conference & Exhibition (ACCE)

The Diamond Banquet & Conference Center ALL DAY
at the Suburban Collection Showplace September 6-8, 2017
Novi, MI USA

IAG Parts Nomination Deadline

September 13, 2017

First Round - Automotive Innovation Awards Judging

Celanese Corp. 8:00 a.m.- 5:00 p.m.
Auburn Hills, MI USA September 27-28, 2017

SPE Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. 5:30 - 7:30 p.m.
Troy, MI USA October 2, 2017

19th-Annual SPE TPO Automotive Engineered Polyolefins Conference (TPO)

Detroit-Troy Marriott ALL DAY
Troy, MI USA October 1-4, 2017

Second Round / Blue Ribbon - Automotive Innovation Awards Judging

Celanese Corp. 8:00 a.m.- 5:00 p.m.
Auburn Hills, MI USA October 9, 2017

47th-Annual SPE Automotive Innovation Awards Gala

Burton Manor 5:00-11:00 p.m.
Livonia, MI USA November 8, 2017

SPE Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. 5:30 - 7:30 p.m.
Troy, MI USA December 4, 2017

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

<http://speautomotive.com/ec>

EEmail 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 12th-annual Auto Epcon, **Plastics on the Move**, Automotive Engineering Plastics Conference, was May 2nd at the Troy Marriott, Michigan. This one day event was well worth the price of admission. Led by Conference Executive Chairman Ankil Shah of Toyota Motors North America, excellent keynotes were given by Dr. Kevin Bolon of the EPA, Mark Voss of General Motors and Kevin Riddell of LMC Automotive. An overall GREAT JOB!! by the Auto Epcon team led by co-chairs Sandra McClelland, Solvay Specialty Polymers, and Dr. Gary Kogowski, Ravago Holdings Americas, and supported by many SPE Detroit Section, SPE Automotive Division and SPE Injection Molding Division teammates.

The conference included 33 technical talks in three concurrent tracks. Two of the 33 talks have been condensed and added into this newsletter for your reading pleasure. *Introduction to the usage of Thermally Conductive Thermoplastic Compounds in Applications Requiring Heat Dissipation* by Paula Kruger of DSM covers a hot topic (no pun intended) in the industry today. *Chemical Resistance of PMMA, ASA and ASA+PC Materials Used in Automotive Exterior Trim Applications* by Tom Pickett of General Motors touches on environmental stress cracking (ESC) which Jeffrey Jansen of the Madison Group says is "the leading mechanism of plastic component failure". For a more detailed review of the Auto Epcon, please reference Gary Kogowski's summary also in this newsletter.

Just one week later, ANTEC 2017, The Plastics Annual Technology Conference, was held in Anaheim, California, May 8th – 10th. The "pre-day", Sunday, May 7th, was busy with four main events:

1. The morning **Counselor Meeting** was attended by our Suresh Shah. See his article summary enclosed.
2. At the noontime **Leadership Recognition Reception**, the Automotive Division and Detroit Section were recognized as recipients of both the Pinnacle GOLD Award and the Communications Excellence Award. The Pinnacle GOLD goes to Sections and Divisions that successfully create and deliver member value during the year in four categories of achievement: organization, technical programming, membership and communications. The Communications Excellence Award program was established in 2009 to recognize Sections and Divisions that implement effective communication practices. In the photo below, I joined Eve Vitale and Sandra McClelland of the SPE Detroit Section to accept the awards from outgoing, 2016-2017 SPE President Scott Owens of Chemtrusion, Inc and incoming, 2017-2018 President Dr. Raed Al-Zubi.



ANTEC® 2017
The Plastics Technology Conference
May 8-10 - Anaheim, CA



Welcome

3. In the afternoon, the **Next Generation Advisory Board (NGAB) "Pilot Our Future"** event involved rotating, five minute conversations between industry professionals and students. It was a lot of fun engaging with a variety of enthusiastic college students.



4. Then, on Sunday night, the formal **SPE Awards and 75th Anniversary Gala** was held and two of the awards were co-sponsored by the Automotive Division. The International Award was given to Dr. Tadamoto Sakai who, in more than 40 years of plastics experience in Japan, has produced more than 200 technical papers and 70 patents. Dr. Sakai was accompanied by a Geisha in full, traditional dress.



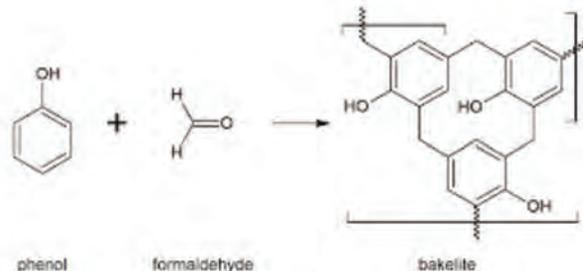
The Fred Schwab Education Award went to Dr. Ica Manaz-Zloczower, who is shown below. Professor Manaz-Zloczower, currently in the Department of Macromolecular Science and Engineering at Case Western Reserve University, has more than 160 publications and a number of book chapters and patents. Truly an impressive pair among all the award winners that evening.



SPE CEO Wim De Vos, who will step down in June, introduced his successor at the Awards Dinner, Patrick Farrey, and ended his speech by concatenating quotes from three, prominent politicians: **"Let's Make SPE Great Again,** because altogether **Yes We Can,** and don't worry, **I'LL BE BACK**". (Donald, Barack and Arnold, of course :)



Another highlight of the evening was the showing of the short film *All Things Bakelite* which is the "Life and Times of Leo Baekeland", as compiled by his great grandson, Hugh Karraker. Baekeland, a Belgian born chemist, invented the first wholly synthetic plastic, Bakelite in 1907, an inexpensive, nonflammable, versatile plastic. Check out the story of this remarkable early plastic pioneer at allthingsbakelite.com.



On Monday, May 8th, the Automotive Division had two conference sessions that are summarized inside this newsletter by Dr. Norm Kakarala, our Automotive Division ANTEC Program Lead. Many thanks to our Board members who contributed to the excellent sessions, including Norm, Dr. Alper Kiziltas, Umesh Gandhi, Dr. Suresh Shah and Andy Stecher. Please check out Norm's notes on ANTEC 2017 later in this newsletter.

On Tuesday, May 9th, at ANTEC, the SPE honored plastic products that meet the ultimate test of value by making our lives better in some way. A panel of judges selected the winners of the 4th annual *Plastics for Life™* Global Parts Competition from among a wide range of parts that had already won in competitions at previous SPE events during the past year. The Automotive Division had a Winner in the Sustaining Life category: the General Motors-2016 Chevy Equinox & GMC Sierra Engine Cover Insulator.

In the picture below, I am accepting the award on behalf of the Automotive Division from former SPE President John Ratzlaff.



You may recall that the engine cover insulation was our Environmental Category Winner at the 2016 Innovation Awards Gala. Under a General Motors developed resource conservation and job creation program called “Do Your Part”, 1.2 million water bottles from General Motors’ Michigan facilities as well as 2 million bottles generated by the Flint Michigan contaminated water crisis were recycled through a complex supply chain. The recycled PET was processed into fleece used in the 2016 GM Equinox Terrain V-6 engine covers. Other uses of this material include air filters for GM plants and insulation in coats that double as sleeping bags for the homeless manufactured by formerly homeless people as part of a jobs training program. Congrats on another winner for the team! SPE Blowmolding and Thermoforming divisions won the other awards.

Another highlight at the conference was the Wednesday afternoon **Student Awards Luncheon**. Your SPE Automotive Division contributed \$2500 to the students for this year’s ANTEC 2017 and I was very pleased to learn that 210 students attended, 34 were supported for travel, 86 had speed interviews and 45 posters were presented.



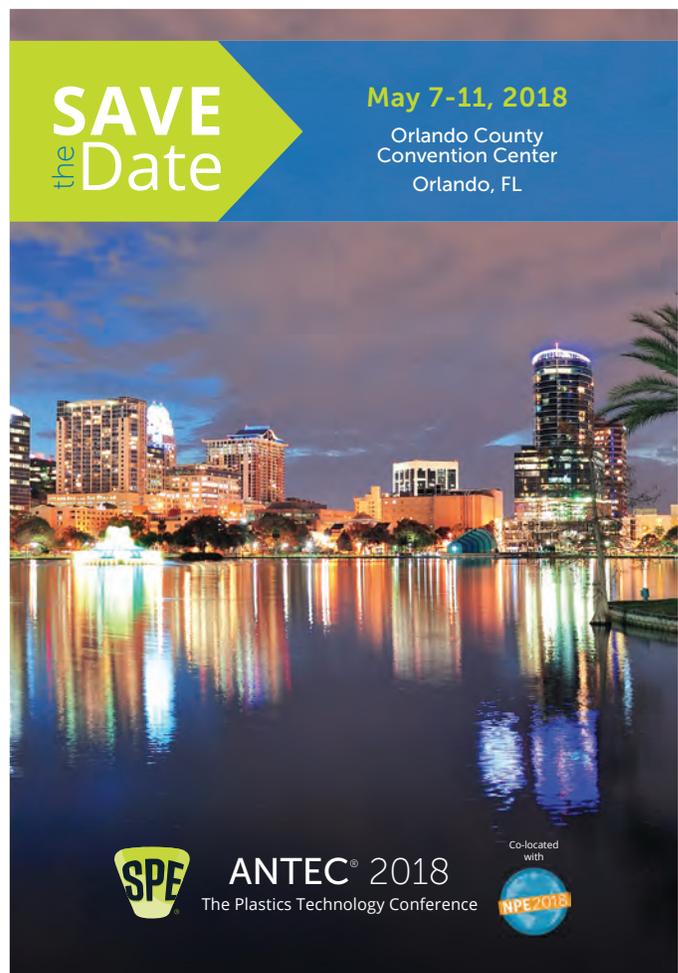
In a final note about ANTEC, please Save the Dates for

- ANTEC 2018 at NPE in Orlando, Florida, May 7-9, 2018 and
- ANTEC 2019 in Detroit, Michigan, March 18-21, 2019

After a summer hiatus, I hope to see you all at one (or more) of these Detroit-area SPE events:

1. The SPE Automotive Division Golf Outing at Fieldstone on September 5th.
2. The Automotive Composites Conference and Exhibition (ACCE) at the Suburban Collection Showplace in Novi, MI on September 6th – 8th .
3. The TPO Conference at the Troy Marriott on October 1st – 4th .
4. The Innovation Awards Gala at the Burton Manor in Livonia on November 9th .

Wishing everyone a great Summer!!!

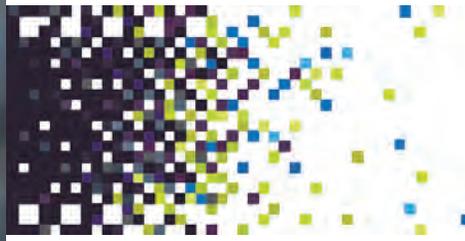


SAVE the Date

May 7-11, 2018
Orlando County Convention Center
Orlando, FL

SPE ANTEC® 2018
The Plastics Technology Conference

Co-located with
NPE 2018



ANTEC® 2017

The plastics technology conference
May 8–10—Anaheim, CA

by Norm Kakarala, ANTEC Program Chair

2017 SPE ANTEC Recap – Automotive Sessions

The 2017 SPE ANTEC was held at the Anaheim Hilton, CA from May 8th to 10th. The participation was good with 1310 registrants and had 89 sessions organized by 35 Divisions and SIGs with 420 speakers. Students had 45 posters and the show had 70 exhibitors.

The two automotive sessions (Materials and Processes in the morning and Application Developments in the afternoon) were held on Monday May 8th. Matt Carroll, Chair of the Automotive Division gave the Plenary Presentation for the Automotive Sessions and provided highlights of evolving industry trends in automotive plastics for Lightweighting, electric/hybrid vehicles, and autonomous vehicles. The presentation was well received with many questions after the talk and the room was full with many standing in the hallway.

Dr. Suresh Shah gave one talk in each session reviewing technical highlights of the recipients of the Finalists and the Winner Awards of different categories at the 2016 SPE Automotive Division Innovation Awards Banquet. We had to limit the number of questions and he had many requests for a copy of his presentations.

Dr. Alper Kizilits of Ford presented Strategies and Future Challenges for Sustainable Materials in Automotive Industry with examples of use of several biobased (soy containing foams, wheat grass and natural fibers, and others) materials in many components of current Ford vehicles.

Cary Veith of Esprix Technologies described the benefits of aliphatic polyketones in automotive fuel systems and under-the-hood components, Khoren Sahagian (substituted for Andy Stecher) of Plasmatreat NA reviewed how atmospheric plasma provides permanent bonds between dissimilar materials. Yu Yang Song of Toyota

discussed the importance of initial fiber orientation on the final part properties with the compression molding. Matt Thompson of Advanced Composites reviewed weight reduction strategies with TPO materials with no compromise on properties or performance.

In the Plastics Applications Session, Suresh gave the first talk on the category winners from the Automotive Innovations Awards Banquet. David Kosse from the Celanese Corp. discussed how high flow long glass fiber reinforced thermoplastic enables ultra-thin light weight automotive structural parts.

Omar Faruk of Ford Motor and Adjunct Professor at the U. of Toronto, Canada discussed the use of recycled carbon fiber reinforced polyamide composite in automotive prototype parts. Choel-hee Parks of GS Caltex presented a paper on how the Polyolefin Elastomer selection affects soiling resistance. Mitsubishi Engineering Plastics Corp. had presented two papers: one on improvement of optical properties of polycarbonate light guide applications and the other on Development of Laser Direct Structuring Polycarbonate and Polyamide materials for soldering. Luigi Alzati of Imerys presented a paper on Effect of Graphite Selection on Thermally Conductive Compounds for LED Lamp Heat Sinks.

At the end of the automotive sessions, Matt Carroll held an Automotive Division Membership Meeting and reviewed the current activities and conferences the division holds every year in Detroit.



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“As the auto industry is progressing to meet 2025 CAFE (corporate average fuel economy) and regional emissions standards, it is also advancing rapidly with intelligent vehicle technologies, many of which are already present on today’s cars and trucks,” explains Jeffrey Helms, global automotive director, Celanese Corp. who returns as the 2017 **SPE Automotive Innovation Awards** chair. “Plastics and composites have always been a material solution for lightweighting, comfort, performance and compact design. These same materials are now enabling the design of parts and components for autonomous vehicle components and subsystems. The intelligent use of the right plastics and robust design will



assist automakers and their suppliers in delivering the technologies and features that customers want while meeting regulatory or affordability targets. This led to selection of *Intelligent Automotive Design with Plastics* as our 2017 program theme. Last year, our program attracted the largest attendance in recent history, with close to 800 attendees, and with increasing interest in intelligent vehicle systems, including autonomous vehicles, we expect this year’s attendance to be that or higher.

About the Automotive Innovation Awards Competition & Gala

Since 1970, the **SPE Automotive Innovation Awards Competition** has highlighted the positive changes that polymeric materials have brought to automotive and ground-transportation industries, such as weight and cost reduction, parts consolidation, increased safety, and enhanced aesthetics and design freedom. At the time the competition started, in 1970, many OEM designers and engineers thought of plastics as inexpensive replacements for more “traditional” materials. To help communicate that plastics were capable of far more functionality than their typical use as decorative knobs and ashtrays indicated, members of the board of directors of SPE’s Automotive Division created the competition to recognize successful and innovative plastics applications and to communicate their benefits to OEMs, media, and the public.

Over the years, the competition drew attention to plastics as an underutilized design tool and made industry aware of more progressive ways of designing, engineering, and manufacturing automotive components. From its humble beginnings, the competition has grown to be one of the most fiercely contested recognition events in the automotive and plastics industries.

Today, polymeric materials are no longer substitutes for more expensive materials, but rather are the materials of choice in hundreds of different applications throughout the vehicle. Without plastics, many of the auto industry’s most common comfort, control, and safety applications would not be possible.

During the competition phase of the event, dozens of teams made up of OEMs and suppliers work for months to hone submission forms and presentations describing their part, system, or complete vehicle module to support claims that it is the year’s **“Most Innovative Use of Plastics.”** To win, teams must survive a pre-competition review and two rounds of presentations before industry and media judges.

There is no cost to nominate parts, however, nominations that are accepted into the competition need to be presented (in person or via webinar) by their nominating teams during the first round of **Automotive Innovation Awards Competition** judging, September 27 – 28, 2017 in Auburn Hills, Michigan. Finalists from that round advance to a second presentation before a panel of Blue Ribbon judges made up of media, retired chief engineers, and other industry experts

on October 9, 2017 (also in Auburn Hills, Mich.) Winners of each part category, the Grand Award, Hall of Fame, and Lifetime Achievement winner will all be honored during the **Automotive Innovation Awards Gala** on November 8, 2017. This annual event typically draws over 700 OEM engineers, automotive and plastics industry executives, and media. Funds raised from the event are used to support SPE educational programs including technical seminars and conferences, which help educate and secure the role of plastics in the advancement of the automobile.

Current competition categories include:

- Aftermarket
- Body Exterior
- Body Interior
- Chassis/Hardware
- Electrical Systems
- Environmental
- Hall of Fame
- Materials
- Process, Assembly & Enabling Technologies
- Powertrain
- Safety

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 Innovation Awards Competition and Gala see www.speautomotive.com.

For more information on the Society of Plastics Engineers, visit www.4spe.org.

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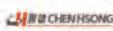
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| Appliance/3C Electronics | 21-22 · 9 · 2017 Shunde, China |  Midea |  |
| Top Packaging & Converting Solutions | 20 · 10 · 2017 Suzhou, China |  |  |
| Automotive | 2-3 · 11 · 2017 Wuhan, China |  DFM |  |
| New Materials Through Additives and Compounding | 7-8 · 12 · 2017 Shenzhen, China |  SPF |  |

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Call for Nominations

• Most Innovative Use of Plastics Awards

Go to www.speautomotive.com to submit nominations and get more information.

For more information on the Society of Plastics Engineers, visit www.4spe.org.

Sponsorship Opportunities

This annual event typically draws over 700 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.

The Automotive Division of the Society of Plastics Engineers (SPE®) is announcing a "Call for Nominations" for its 47th-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 8, 2017** at the Burton Manor in Livonia, Mich. Winning part nominations (*due by September, 13, 2017*) in 9 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 will be honored with a **Hall of Fame** award.

Innovative Part Competition Categories:

- Aftermarket
- Body Exterior
- Body Interior
- Chassis/Hardware
- Electrical Systems
- Environmental
- Hall of Fame
- Materials
- Process, Assembly & Enabling Technologies
- Powertrain
- Safety



Nov 8, 2017

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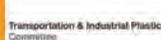
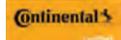
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A photograph of two Great Danes sitting upright in the back seat of a car with its trunk open. The dog on the left is black and white, wearing a red collar. The dog on the right is grey and white, wearing a blue collar. The car's interior and the open trunk lid are visible. The background shows green foliage and a clear sky.

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AUTOMOTIVE COMPOSITES CONFERENCE & EXHIBITION

World's Leading Automotive Composites Forum

SOCIETY OF PLASTICS ENGINEERS
AUTOMOTIVE & COMPOSITES DIVISIONS

Work is well underway for the 2017 SPE Automotive Composites Conference & Exhibition (ACCE). This year's show returns September 6-8, 2017 to The Diamond Banquet & Conference Center at the Suburban Collection Showplace in Novi, Mich. in the Detroit area. Now in its seventeenth year, the ACCE is the world's leading forum for automotive composites and draws over 900 exhibitors, speakers, and attendees from 15 countries on five continents to the Detroit area.

Dale Brosius of IACMI secured the venue and also suggested our theme, *Composites: Solutions for a Multi-Material World*, after noting that multi-material vehicles are a hot topic these days and that "various grades of steel, aluminum and composites/plastics will all have to fit together to achieve future lightweighting." Rani Richardson, Composites & Additive Manufacturing Business Experience Consultant, Dassault Systèmes, has agreed to once again serve as the SPE ACCE event chair.

Call for Papers

The Technical Program Co-Chairmen this year are Dr. Michael Connolly, Huntsman and Creig Bowland, CPIC Fiberglass NA, 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 **June 15, 2017** and full papers or non-commercial presentations by **July 15, 2017**. Authors who submit full papers (not presentations) in the proper format will be considered for the conference's Dr. Jackie Rehkopf 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 Conference Parts Competition

The committee also issued a call for nominations for its sixth-annual ACCE parts competition. Prizes for the Most Innovative Composites Application will be awarded in four categories — Materials Innovation, Process Innovation and Development/Prototype 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.

There is no cost to enter the competition. Any registered conference participant (speaker, sponsor/exhibitor, or attendee) may nominate original equipment or aftermarket composite parts on or in development for passenger cars, light trucks or heavy trucks from any geography. Nominations including descriptions and photos about the application's innovations are due **August 31, 2017** and should be eMailed to teri@intuitgroup.com. Physical parts must be brought to the SPE ACCE for final review by judges during a formal walk-through at the show.



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ATTEND THE WORLD'S LEADING AUTOMOTIVE COMPOSITES FORUM

You're invited to attend the 17th-annual SPE Automotive Composites Conference and Exhibition (ACCE), September 6-8, 2017 in the Detroit suburbs. The show – which has become *the world's leading automotive composites forum* – features technical sessions, panel discussions, keynotes, receptions, and exhibits highlighting advances in materials, processes, and equipment for both thermoset and thermoplastic composites in a wide variety of transportation applications.

PRESENT BEFORE AN ENGAGED, GLOBAL AUDIENCE

The SPE ACCE draws over 900 attendees from 15 countries on 5 continents who are interested in learning about the latest composites technologies. Few conferences of any size offer such an engaged, global audience vitally interested in hearing the latest composites advances. Interested in presenting your latest research? Abstracts are due **June 15, 2017** and Papers on **July 15, 2017** to allow time for peer review. Submit abstracts via <http://SubmitACCEpapers.com>.

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SEPT 6-8 2017

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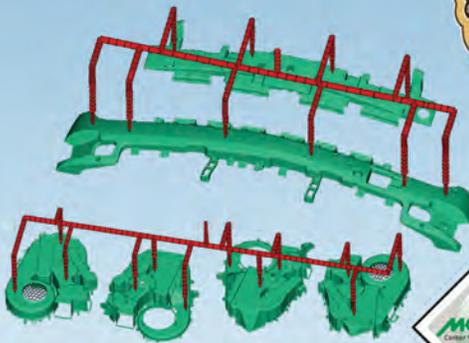
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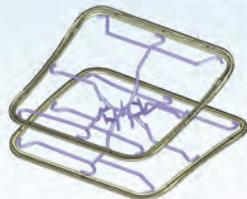
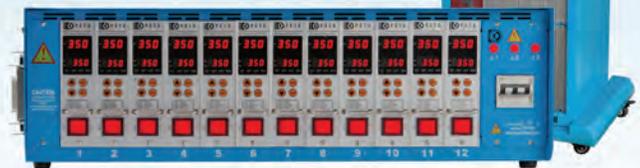
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MEMBERSHIP REPORT

Steven VanLoozen,
SPE Automotive Division Membership Chair

I would like to first thank everyone reading this for their ongoing support for SPE. Our membership currently stands at 939. My goal for 2017 is to get this number back above one thousand and I know this should be easily achieved.

We are working on a brilliant idea from Crystal VanHouten that we plan to roll out very soon and feature at the 2017 Innovation Awards Gala. We want to focus on how to bring youth and enthusiasm into the automotive industry along with our SPE division. The hope is that we can send a message that energizes our current membership and compels some of the best and brightest in our industry to want to be a part of the SPE Automotive Division. Have a great summer everyone!



TREASURER'S REPORT

Bonnie Bennyhoff,
SPE Automotive Division Treasurer

As we wind down the current fiscal year, the Automotive Division is in good health financially. We will be looking for new ways to support educational outreach and hope to "bump up" the savings account balance. A big THANK YOU to all of our sponsors and supporters!

As of May 23, 2017, the division's account balances were:

| | |
|-----------|------------------|
| Checking: | \$517,309.24 USD |
| PayPal | 60.00 USD |
| Savings: | \$ 27,455.38 USD |
| Total: | \$544,824.62 USD |



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12th Annual AUTO EPCON

Plastics on the Move

May 2, 2017
Detroit Marriott Troy - Troy MI



Sponsored by the SPE
Detroit Section & Automotive Division



By Dr. Gary J. Kogowski



The twelfth annual SPE AutoEPCON for 2017 was another great success! Three hundred and eighteen persons registered for the one day conference brought to you by the SPE Detroit Section, Automotive Division, and Injection Molding Division. The SPE AutoEPCON attendees included 47 members from automotive OEM staffs, 74 SPE members, 172 non-members, 7 student SPE members, and 3 media attendees. This was another well attended SPE conference with a record breaking 31 exhibit sponsors. Proceeds for the conference will be used for the education scholarship budget, Plastivan, as well as special events such as the “Kids Christmas Toys Program”.

Ankil Shah (General Manager, Material Engineering, Toyota Motors North America R&D), the conference OEM Executive Chairperson, introduced the conference theme for 2017; “Plastics On The Move”. Ankil brought an OEM perspective to the conference theme and provided a summary of the conference that focused on future trends in light weighting, injection molding processes, and advances in 3D printing.

Kevin Riddell (Senior Manager, NA Powertrain, LMC Automotive) presented the first keynote address entitled “North America Powertrain Outlook: What’s Under the Hood as We Drive Toward and Autonomous Future”.

Mr. Riddell presented different possibilities of global vehicles sales projections into the next decade, the influence of electrified and hybrid vehicles on global sales, vehicle autonomy will take time, and the anticipated change from a 12 volt to a 48 volt vehicle system.

Kevin Bolon, Ph.D. (Engineer, US Environmental Protection Agency, Office of Transportation and Air Quality, Assessment and Standards Division) was our second keynote speaker.

Dr. Bolon stated the the main driving force in the effort to comply with future greenhouse and emission regulations will be mass reduction through the use of plastics, plastic-metal hybrid parts and applications, as well as composites. Implementation of advanced material technologies will depend on the resolution of issues such as economics, manufacturing, vehicle assembly, design, vehicle performance, environmental, legal, as well as customer perceived value. Being a member of the US EPA,

there was the much anticipated question of any hint into the new direction of the currently postponed 2025 emission standards. Dr. Bolon responded that the EPA emission policy and activity is on-hold until the new administration mandates any new emission standards.

Mark Voss (Engineer Group Manager: Body Structures Advanced Composites, General Motors Co.) presented material and manufacturing insights for light weighting and advanced technologies into one of this author’s favorite vehicles, the Chevrolet Corvette. Mark reminisced about a past team meeting he attended where engineers were having a discussion on plastic applications (paraphrasing): “has the limit of plastic usage for vehicle light weighting been reached?” The group leader interrupted the conversation and stated, “It is the job of the engineer to find new and innovative applications and systems for the use of plastic materials”. Thank you, Mark, for this story. Each and every one of us in the plastics industry would do well to remember the group leader’s remark when facing challenging applications.

This year the SPE AutoEPCON conference had six great student moderators: Alice Kilvington, Aaron Beavers, Daniel Pisarski, Dillon Frost, Roger Warmack, and Anthony Maiuri.

Alice Kilvington was the Material Session I student moderator. Alice is a student at Michigan State University majoring in Chemical Engineering. Alice was vice president of the MSU SPE Student Chapter this past year and looks forward to being president next year. Alice has accepted a summer internship at Dart Containers this summer.

AUTO EPCON 2017

Dillon Frost was the student moderator of Session II, Injection Molding and Materials. Dillon attends Kettering University majoring in Chemical Engineering with a minor in Material Science. Dillon is currently the SPE student Chapter President. Dillon plans to graduate during the summer of 2017.

Daniel Pisarski was the student moderator of the Session III 3D Printing and Materials Session. Daniel completed his freshmen year at The University of Michigan. Daniel is a member of the Michigan Autonomous Aerial Vehicle Student Design Team. Daniel is interested in 3D printing.

Aaron Beavers was the session IV Materials student moderator. Aaron is a graduating senior at MSU and president of the MSU SPE Student Chapter. Aaron's major is Chemical Engineering with a Polymer Science concentration. Aaron is seeking employment after graduation.

Roger Warmack was the Session V Injection Molding and Materials student moderator. Roger is a second year Plastics Engineering Technology student at Mid-Michigan Community College. Roger is planning a career in the field of plastics and continuing his education after graduation from MMCC. Roger is a member of the MMCC SPE Student Chapter. Roger is seeking an intern position in the area of polymer science and technology.

Anthony Maiuir was the Session VI, 3D Printing and Material II student moderator. Anthony is a junior at Kettering University majoring in Mechanical Engineering. Anthony is interested in the field of 3D printing.

With thirty two sponsors, the 2017 AutoEPCON remains a key conference for networking, communicating new product development, and OEM attendance. We are grateful for the support of our premier sponsors; DSM Engineering Plastics, DuPont Performance Materials, and Polyplastics; our Associate sponsors AIM Institute, Albis, Ascend Performance Materials, BASF Engineering Plastics, Lanxess, Lotte Advanced Materials, Moldex 3D, and Nylene. This year we had a record number of exhibitors that included A. Schulman, Asahi Kasei Plastics, Autodesk, Clariant, CW Brabender, Datapoint Labs, DME/Mold Masters, EMS-Grivory, Entec Polymers, Evonik, Niche Polymers, Pinfa, Plasmatrete, Sodick, Toray, University of Toledo, and Vertellus. Our advertising, media, and university support sponsors included the American Chemistry Council, Ineos-Styrolution, Penn State University, and Wards Automotive.

Many thanks to our committee members who worked very hard and long to make the 2017 SPE AutoEPCON a success:

- Dr. Gary J. Kogowski – Ravago Holdings Americas – Co-Chair – exhibits, Marriott, program brochure, luncheon dessert menu
- Sandra McClelland – Solvay Specialty Polymers – Co-Chair, technical program, brochure, keynote speakers, and student mentor
- Ed Luibrand – Fiat-Chrysler – sponsorship chair
- Pete Grelle – Fiat-Chrysler – Injection Molding Division, technical program
- Glenn Cannavo – DSM - Marriott, A/V, exhibits
- Scott Marko – SPE National, AutoEPCON Mobile App.
- Kathy Schacht – SPE National - registration
- David Okonski – GM / SPE Injection Molding Division, student mentor
- Suresh Shaw – Delphi Retired – key note speakers
- Chris Surbrook – Midland Compounding – sponsorship liaison
- Sameer Mehta – Asahi Kasei - sponsorship liaison
- Nihir Bhuna – Asahi Kasei - sponsorship liaison
- Karen Rhodes Parker- SPE Detroit Section – brochure, committee logistics
- Steve Van Loozen – SPE Automotive Division – keynote speakers
- Keith Siopes – DSM – 3D Printing Session Chair, student mentor
- Tom Miller – BASF – student mentor
- Stu Allen – Nylene, committee member
- Ryan Tracht – M. Holland – AutoEPCON Mobile App.
- Fred Deans – SPE Automotive Division – committee member
- Crystal VanHouten, student mentor
- Karen Rhodes-Parker – SPE Detroit Section and Automotive Division – brochure, administration
- Bob Haley – Student mentor
- Nippani Rao - Emeritus member, student mentor

The 2018 AutoEPCON is tentatively scheduled for Tuesday, May 1, 2018 at the Detroit-Troy Marriott located at 200 W. Big Beaver Rd, Troy, MI 48084. Please mark your calendars.

AUTO EPCON 2017



Anthony Maiuri (Kettering) presents speaker recognition certification to Tom Pickett (GM)



Student Moderator Alice Kilvington (MSU) prepares for her session



Daniel Pisarski (U of M) presents recognition award to Greg Costantino (DSM Engineering Plastics – Americas)



VIP Lunch table (clockwise): Kevin Bolon (US EPA), Kevin Riddell (LMC Automotive), Prof. Richard Robertson (U of M), Daniel Pisarski (U of M), Tom Miller (BASF), Mark Stevens (Center for Automotive Research), Shashank Modi (CAR), Gina Oliver (American Chemistry Council), and Sandra McClelland (Solvay Specialty Polymers)



Steve VanLoozen (SPE Automotive Division) presents recognition certificate to keynote speaker Mark Voss (GM)



Dillon Frost (Kettering) presents Bill Burham (DSM) with certificate of recognition during the Injection Molding Session



Sandra McClelland (Solvay, SPE AutoEPCON co-chair) presents student moderator recognition certificate to Roger Warmack (MMCC), Aaron Beavers (MSU), and Daniel Pisarski (U of M)



Suresh Shaw and Sandra McClelland networking with exhibit sponsors.



Roger Warmack (MMCC) presents recognition certificate to Srikar Vallury (Moldex 3D) at the Injection Molding Session

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2017 LIFETIME

Lifetime Achievement Award



SPE ANNOUNCES LIFETIME ACHIEVEMENT AWARD WINNER, WILL BE HONORED AT SPE AUTOMOTIVE INNOVATION AWARDS GALA

Dr. Suresh Shah, retired, Senior Technical Fellow at Delphi Corporation, formerly General Motors – ACG (Automotive Components Group) has been named the 2017 *Lifetime Achievement Award* winner by the Automotive Division of the *Society of Plastics Engineers (SPE®)*. Shah is a technical specialist, with over 30 years of experience and more than 45 Intellectual Properties including patents and trade secrets – more than 40% of these are in production, which is far more than the 4% industrial average. Shah advanced plastic processes including gas-assist injection molding, co-injection molding, microcellular molding, hybrid plastic/metal molding, direct (inline-compounded (ILC) long-fiber thermoplastic (D-LFT)

composites and thin wall molding. He also advanced material developments involving natural fiber composites, nanocomposites, thermoplastic polyolefins (TPOs) and thermoplastic elastomers (TPEs). This expertise lead to several game changing innovations including the single piece, all plastic door hardware module known as SuperPlug®, and TPO thermoformable skin for instrument panels. He also developed many other innovative applications for exterior, interior and under-the-hood components. His rare combination of expertise in materials, processes, part design and analysis; has earned him a reputation as one of the best problem solvers in the industry. Shah has won more than 20 prestigious awards internationally. He is respected as an industry expert and a key opinion leader and has been interviewed over 30 times by industry trade journals, presented as a keynote speaker more than 15 times and has presented more than 80 technical papers worldwide. He will be honored for his lifetime of expertise and innovation, contributing to the advancement of the automotive plastics industry, at the *47th-annual Automotive Innovation Awards Gala* on November 8, 2017 at Burton Manor in Livonia, Mich.

ACHIEVEMENT AWARD

Shah credits his success to his education, work experience and participation in professional trade associations. Shah has four degrees: Ph.D. in Polymer Chemistry/Plastics Engineering, and M.S. in Plastics Engineering, both at UMass, Lowell, Massachusetts, BSC-Tech in Plastic Technology at Institute of Chemical Technology (ICT) University of Bombay, India; and a B.S. in Chemistry, St. Xavier's College, University of Gujarat, India. He joined General Motors (GM) in 1985 and worked in several technical positions at GM and Delphi Exterior, Lighting, interior, Safety and Thermal Divisions. Before retirement, he worked as Senior Technical Fellow for many years which was the highest technical position in the corporation. Shah is an active volunteer advancing SPE, serving as councilor since 2016, board member since 1990, automotive division chair (2000) and technical committee member or chair for several conferences since 1987. He has also serviced other professional societies, universities and the next generation with his leadership.

His many honors and awards include:

- 2015 SPE International's most prestigious Research/Engineering Technology Award, one of the highest honors SPE bestows upon an individual every year.
- 2014 Inducted into "Gold Level – Hall of Fame" Innovation Award at Delphi Corporation for his technical contributions and 40+ intellectual properties
- 2011 "SPE Hall of Fame" Product Award for Door Hardware Module, developed in 1993, a game changer and trend setter, used on more than 60 million vehicles
- 2009 Engineering Society of Detroit's (ESD) "Gold Award" as "Scientist of the Year" in Michigan for outstanding professional achievement, selected among ESD's 72 Affiliate Societies.
- 2009 A tribute from Governor of Michigan
- 2003 Recognized as the "Honored Service Member" (HSM) by SPE
- 2001 Inducted as "Fellow of the Society" of Plastics Engineers (SPE)
- 2000 Received SPE "Interior Product Innovation Award" for Pioneering TPO skin application for instrument panel - A FIRST in Industry.
- 1996 & 1998 Nominated for "General Motors' Boss Kettering" award for bringing innovation into production and significant impact on corporate profit
- 1997 General Motors' Presidential Council's Honor Award
- 1995 – 1997 Received Six National and International Prestigious Awards for developing All Plastic One-Piece Door Hardware Inner Module known as "SuperPlug®":
 - SPE International's Highest Award 'Plastics Industrial Product Design Award' during ANTEC (Annual Technical Conference) Minneapolis, 1996
 - Modern Plastics International Process Award, Switzerland 1997
 - PRW Europe Award of Excellence in Transportation Category, London, England 1996
 - IBEC Design Award, Detroit 1996
 - SPE Automotive Product Design award, Washington D.C. 1995
 - DesignFax Magazine Five-star Product of the Month Award 1995
- 1991 SPE Automotive Award for NUMMI Assist Grip Handle by Gas Injection Molding
- 1990 SPI Award of Excellence for Composite Window Guidance Channel by Gas Molding

"Suresh is one of the most creative and innovative technical people that I have ever known – he has so many innovative and first applications that have affected the bottom line of General Motors, it is difficult to list them all on one page," said Irvin E. Poston, PE, and Distinguished Member of SPE, SPE Lifetime Achievement Award Recipient in 2009, General Motors (Retired Head of Plastics Composites Development for 40 years).

LIFETIME ACHIEVEMENT (Continued from Page 21)

"Suresh has proven himself to be one of the best and most prolific inventors I have ever managed. He developed many first to market applications, whose commercialization significantly impacted the profitability and growth of the company. He is, and has been, very visionary; significantly ahead of his time. Several of his innovations have become "Game Changers" and "Trend Setters" in the industry," said Barbara A. Sanders, Director of Advanced Development Group, Delphi Corporation (Now Retired) and Recipient of the SPE® Automotive Division's prestigious "Lifetime Achievement Award" (2006).

Dr. Shah's game changing and industry first developments, working with teams, that are industry standards include

- Microcellular Foaming Process for Driver Side Airbag Cover, Radiator End Tank and HVAC Case
- Thin Wall Molding process for PP HVAC Case and Radiator End Tank technology
- FIRST concept for Plastics/Metal Hybrid Heat Exchanger (automotive radiator)
- FIRST Unique Formulation Approach to Eliminate Mildew Issue by incorporating Special Anti-Microbial Control Release Agent in Plastic Film bonded with paper for HMX
- In-house TPE material for Driver Side Air Bag Cover (DAB)
- FIRST All Plastics Hollow Steering Wheel – a unique approach to reduce weight and integrate functions and wiring
- FIRST to bring In-line Compounding of (LFT-D) Long Glass Fiber Composite and EDCM process (1997) Compression Molding process from Germany to the USA to develop several high end structural composite parts. Worked with team developing Cross Car Beam (2004), In-Mold Lamination (2003), Cockpit Structure, and IP Retainer (2003) etc. to replace metal, reducing weight and cost PP Based Nano-Composites and Hybrid Fibers for ECM Process
- Paintless TPO Skin for Instrument Panels
- FIRST TPO Skin formulation to replace PVC skin for instrument panel. In-house TPO compounding using Twin Screw Extrusion process. TPO skin has become trend-setter in Industry now.
- Natural Fiber Technology ((Flax, Jute, Hemp and Kenaf) for Instrument Panel and Door Panel in 2000, far ahead of time
- FIRST to introduce MODULE concept - All Plastics Door Inner Module known as "SuperPlug®" replacing 50 metal pieces to parts to one plastics module (significant parts integration with multi-functionality and light weight). Received seven prestigious awards worldwide including "SPE International Plastics Industrial Product Design award" during ANTEC in 1996. In production on more than 60 million vehicles – Trend setter in industry – Metal is almost replaced. SABIC (former GE Plastics) was partner as material development.
- Applied Artificial Intelligence (AI) and Taguchi methods for process optimization, in-cavity temperature/pressure sensors, additive manufacturing (3D printing) for prototyping and fit and function, Infra-red camera for process monitoring, sequential valve gating etc. (1993 – far ahead of time)
- FIRST Introduced and Licensed Gas Injection Molding in USA from Cinpres Process, UK.
- Inline Extrusion-Reshaping Process for High Gloss, Metallic Body Side Molding
- Co-Injection Molding Process for Large Body Side Molding
- SMC Formulations for Grille Opening Panels (GOP) for Class A Surface
- Structural RIM Process and all Plastics Window Frame Molding Technology

On **Wednesday, November 8, 2017**, Dr. Shah will be honored for his significant contributions to the automotive industry at the 47th-annual **SPE Automotive Innovation Awards Gala** at Burton Manor in Livonia, Mich., where winning

PAST SPE AUTOMOTIVE LIFETIME ACHIEVEMENT AWARD WINNERS:

part nominations and the teams that developed them will be honored during an evening that celebrates automotive plastics innovation. The evening begins with a VIP Cocktail Reception at 4:30 p.m. sponsored by Celanese Corp. At 5:00 p.m. the main exhibit area opens for general admission and guests can review this year's **Automotive Innovation Awards** part nominations and enjoy the vehicles on display that always are a highlight of the show. Dinner will begin at 6:30 p.m. and the awards program itself will last from 7:00-9:00 p.m. For those who wish to extend merrymaking and networking activities, the ever-popular **Afterglow** – also sponsored by Celanese – runs from 9:00-11:00 p.m.

SPE's Automotive Innovation Awards Program is the oldest and largest competition of its kind in the world. Dozens of teams made up of OEMs, tier suppliers, and polymer producers submit nominations describing their part, system, or complete vehicle and why it merits the claim as the *Year's Most Innovative Use of Plastics*. This annual event typically draws over 700 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 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 Innovation Awards Competition and Gala** see www.speautomotive.com. For more information on the **Society of Plastics Engineers**, see www.4spe.org.

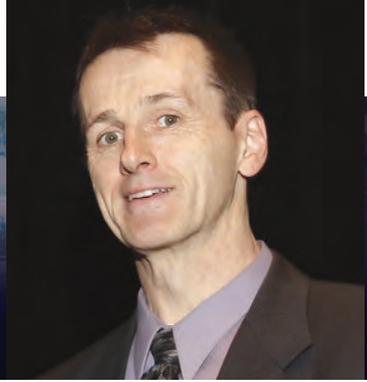
First given in 2001, the SPE Automotive **Lifetime Achievement Award** recognizes the technical achievements of individuals whose work – in research, design, and/or engineering – has led to significant integration of polymeric materials on passenger vehicles. Past winners include:

- J.T. Battenberg III, then chairman and chief-executive officer of Delphi Corp.
- Bernard Robertson, then executive vice-president of DaimlerChrysler
- Robert Schaad, chairman of Husky Injection Molding Systems, Ltd.
- Tom Moore, retired vice-president, Liberty and Technical Affairs at then DaimlerChrysler
- Mr. Shigeki Suzuki, general manager - Materials Division, Toyota Motor Co.
- Barbara Sanders, then director-Advanced Development & Engineering Processes, Delphi Corp.
- Josh Madden, retired executive at General Motors Corp. (GM) & Volkswagen of America
- Frank Macher, former CEO of Collins & Aikman Corp., Federal Mogul Corp., and ITT Automotive
- Irv Poston, retired head of the Plastics (Composites) Development-Technical Center, GM
- Allan Murray, Ph.D., retired technology director at Ford Motor Co.
- David B. Reed P.E., retired staff engineer, Product Engineering, GM
- Gary Lowndale, P.E., then chief technology officer, Plasan Carbon Composites
- Roy Sjöberg, P.E., retired staff engineer - Body, Chevrolet-Pontiac-Canada Div., GM and retired executive engineer-Viper Project, Chrysler Corp.
- Dr. Norm Kakarala, retired senior technical fellow, Inteva Products LLC
- Fredrick Deans, P.E., chief marketing officer, Allied Composite Technologies LLC
- Dr. Lawrence T. Drzal, university distinguished professor of Chemical Engineering and Director-Composite Materials and Structures Center at Michigan State University College of Engineering



SECRETARY'S REPORT

SPE Automotive Division Board
APRIL 24, 2017 Meeting Minutes



ATTENDEES

Matt Carroll,
Tom Pickett,
Dhanendra Nagwanshi,
Alper Kiziltas,

Dave Helmer,
Suresh Shah,
Cynthia Flanigan,
Peter Bejin,

Brian Haggart,
Teri Chouinard,
Mark Lapain,
Fred Deans,

Steve Van Loozen,
*Ph: Andy Stecher,
Nippani Rao,
Ron Price,*

*Jeff Helms,
Bonnie Bennyhoff*

Meeting was held at the ACC (American Chemistry Council) in Troy, 5:32pm – 6:57pm

OPENING – Matt Carroll

Review of Agenda for Meeting. Tom Pickett agreed to take Meeting Minutes.

FINANCIAL – Bonnie Bennyhoff

Balance sheet reviewed. Everything is on track and we are in good financial position. Money coming in from Automotive Composite Conference. Financial year to date we have Net Revenue of \$277,526. Bonnie compared revenues 2017 vs 2016. Revenue looks good. "Who owes me" list was reviewed. Total expenditures to date is \$629,197.09. The Automotive Composite Conference has the majority of expenditure with expenses of \$320,153.

Account Balances as of April 24, 2017 – Checking \$469,513.39 Savings \$27,454.48, Paypal \$100 for a Total of \$497,067.87

ACCE REPORT – Teri Chouinard, Bonnie Bennyhoff

Program Guide and Ad swaps are set up. Behind on papers. 17 abstracts submitted. Deadline for abstracts extended to June 15, 2017. Paper deadline is July 15th. Sponsorship is at same level as last year to date. 56 sponsors totaling \$262,250. Goal is to reach \$340,000 with 65 sponsors. Ideas were discussed to increase the number of papers. The Session Chairs need to solicit abstracts.

DESIGN IN PLASTICS - Steve Van Loozen

Design in Plastics Conference 2017 features presentations, panels and workshops on materials, processes, collaboration, design thinking, future trends and more. Discuss having HP stage new multi-jet printer at CCS for students to print designs. Working to secure additional scholarship sponsors. Automotive Division would provide scholarship in the amount to be determined (like \$5K for 1st, \$3K for 2nd, \$2K for 3rd).

Steve Van Loozen made a motion to not to exceed \$10,000 for scholarship Award for Design in Plastics Conference. Motion passed. Winners could be invited to the Awards Gala to present also.

EDUCATION – Matt Carroll

Gary Kogowski's report presented by Matt Carroll. List of active Student Sections in Michigan supported by SPE Detroit Section. Detroit Section would welcome joint participation. () = number of student members

- Schoolcraft Community College (9)
- Michigan State University (6)
- Ferris State University (94)
- University of Michigan (Go Blue) (8)
- Wayne State University (2)
- Kettering University (18)
- Western Michigan University (1)
- Mid-Michigan Community College (12)
- Delta College
- Saginaw Valley State University

Matt would like to have people volunteer and reach out to students and invite them to SPE Automotive Events. Peter Bejin would like to work with U of M and Fred and Nippani are already engaged with MSU.

SPE AD donated \$2500 to the 2017 ANTEC Student Activity fund.

Explorathon attended by Bonnie Bennyhoff. Held at Cranbrook Kingswood Middle School for Girls on March 22. Approximately 400 students attended in total. 21 different workshops.

PlastiVan is booked for the remainder of the year so need to start planning visits for next year. Eve Vitale is running PlastiVan for SPE HQ.

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 5/15/2017. Open space available for article

SECRETARY'S REPORT Continued

SPE Automotive Division Board
APRIL 24, 2017 Meeting Minutes



submission. Matt would like to send newsletters also to recently lapsed members so might consider 1200 next edition.

Sponsorship to Date for Newsletter: Approx. \$52,000 - \$57,000 with 15 sponsors or equivalent to \$13,000 - \$14,000 income per issues.

Cost to produce approximately \$7,000 – Bonnie to verify profit per issue.

CHAIR REPORT – Matt Carroll

Schedule of Events, Awards, the 2016/2017 SPE Automotive Executive Committee, Committee Chairs, and Board of Directors was updated.

Schedule of Events

June 12, 2017 Auto Board Meeting.

August 14, 2017 Auto Board Meeting will be scheduled.

Awards

The SPE Automotive Division received the Gold Pinnacle Award from SPE International. Also SPE Automotive Division received the 2017 SPE Communication Excellence Award.

Executive / Committee Chairs / Board of Directors

Alper Kiziltas was elected Education Co-Chair and will join the Executive Committee for next year. Gary Kogowski agreed to be Awards Chair. Dave Helmer is Chair Elect. Proposed new Board Members Mark Bahm, Gary Kogowski and Brian Haggart.

ANTEC – Matt Carroll

Matt presented Norm Kakarala's report. ANTEC is May 8-10, 2017 at the Hilton Anaheim, CA. There are 2 automotive sessions. The Automotive Division Business Meeting is scheduled at the end of the Automotive Session. There will be a Plastics for Life Global Parts Competition. Jeff Helms has submitted five winners from the Automotive Innovations Awards. There will also be the Plastic Race.

AUTOEPCON – Matt Carroll

Matt presented Gary Kogowski's report. May 2, 2017 is AutoEPCON. OEM can attend free. 3 simultaneous sessions on materials, injection molding, 3D printing. There is a morning & afternoon session for a total of 6 sessions.

MEMBERSHIP – Steve Van Loozen

Automotive has 959 active members. There are 97 elapsed memberships. There are 976 3D Printing SIG members. memberships are active

IAG – Jeff Helms, IAG Chair, Teri Chouinard, IAG MARCOM

IAG is on track. The big push won't start until August. Added a couple of additional judges. Jeff wants to add more judges to the Blue Ribbon Judging. Send Jeff names of potential Blue Ribbon judges. Lifetime Achievement is in process. HOF committee is working on this year's winner.

INTERSOCIETY REPORT – Dhanendra Nagwanshi

SAE World Congress 2017. Exhibition: 178 companies – Auto OEMs, Tier 1s, Materials, Services, Equipment, Academia. Technical sessions 6 technologies – Design & Manufacturing, Powertrain, Management & Markets, Electronics, Materials, Sustainability, Body/Safety/Structure. SAE Detroit Section talked to.

COMMITTEE UPDATES – Matt Carroll

Social, Golf, Councilor, New Business

Fred Deans requested money for Plastivan training. A motion by Fred Dean to approve \$3750 for PlastiVan to visit Bay Mills Community College, contingent upon a matching grant of \$3750 from Bay Mills. Mark Lapain seconded. Discussion if Plastivan curriculum is at the appropriate level for Community College students. Fred informed the Board that it is. Motion passed.

Meeting adjourned.

Minutes

19th ANNUAL
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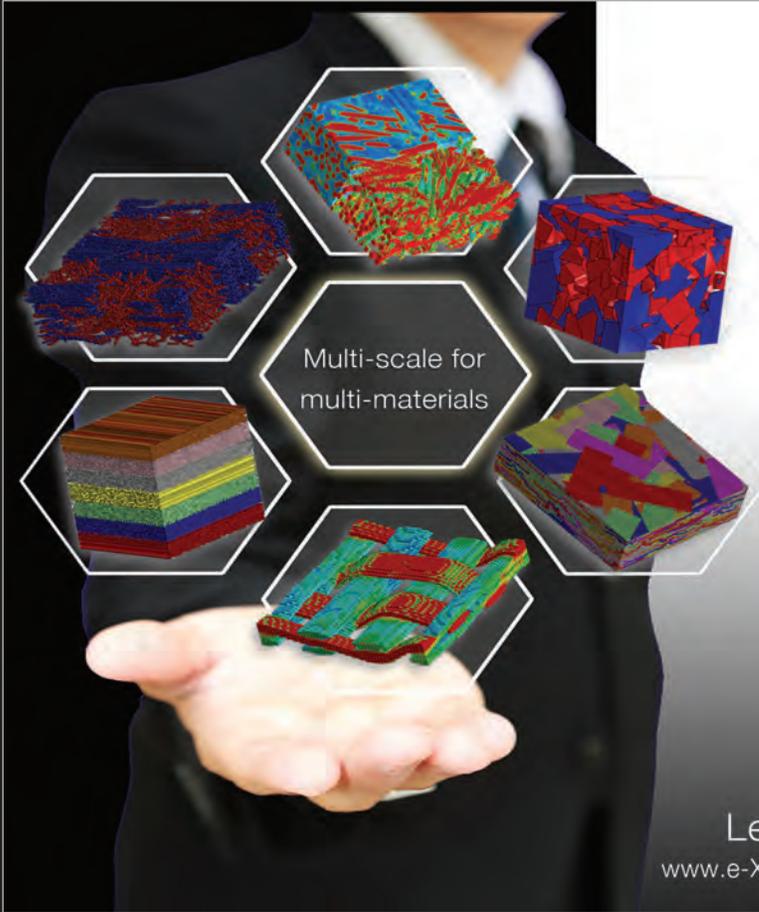
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Phosphorus, Inorganic and Nitrogen Flame Retardants North America, Inc. (PINFA NA) and SAMPE are sponsoring this event. This workshop will offer insight into trends in automotive design that will affect the choice of flame retardants and materials in transportation solutions. Attendees will hear from automobile OEMs and their tier suppliers, and regulatory experts regarding 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 include panel discussions on these topics. In addition a formulator workshop will co-locate with the event.

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For up to date details on conference: please visit www.pinfa.org



COUNCILOR'S REPORT

May 6, 2017 Council Meeting Minutes
at ANTEC, Anaheim, CA

by, Suresh Shah, SPE Automotive Division Councilor Chair

Opening Remarks and Approval of Past Remote Council Meeting, March 9th, 2017

Scott Owen Past-President had opening remarks and approval of Agenda, followed by a request to approve last meeting agenda by B. Landes. Both were approved by all.

Leadership Workshop

It was organized by new President Rael AlZubi naming "The Plastics Race". The council members were divided in several teams and were asked to go over more than 30 electronic posters and answer the multiple choice questions using cell phone app regarding SPE organization, processing, part design, materials etc. It was great networking. The top three winners were announced.

Election Recap and Results

Dick Cameron announced the names of people who got elected. Click for detail information - <http://www.4spe.org/Leadership/Content.aspx?ItemNumber=6486&navItemNumber=6487>

Financial Update – Wim De Vos, CEO and Jeremy Dworshak, Treasurer Recap 2016

- We have received the AUDIT report from our auditor 1 week ago.
- It confirms the P&L figures are OK.
- The details of the report have been discussed at the FC + EC and was approved.
- The AUDIT report has been posted on LL (leadership Lane) on "The Chain" of SPE website.

YTD April 2017 – Variances

Revenues

- Membership \$\$ on lower level but stabilized versus Q4/2016
- Advertisement/sponsorship: much better than 2016
- Events: ANTEC Exhibit low, attendees high
- Extra-ordinary income for Journals- \$ 1.5 M (Negotiated and signed contract with WILEY – 10 years , 2018-2028)

Expenses

- Events expenses will catch up
- Extra-ordinary expenses related to CEO search + training

YTD budget for 2017

- Revenue \$1.6 million, Expenses - \$1.4 million, Total forecast is \$267K in income.

Cash

- Our cash situation is comfortable at this moment, this is however typical for our seasonality towards and after ANTEC. At the end of April, we had \$ 229 K.

Full year 2017 – Outlook

- Due to the extra-ordinary income from the Journals, SPE will end this year with a profit of about 1.5 Million \$. (depending on how our other operations perform).
- Corporate Sales are notably improving and should grow further
- ANTEC although still very profitable, revenues keep slightly declining. This is off-set by revenues from new and additional events.
- All expenses are very well under control. The extra-ordinary expenses related to the CEO search and others are only a one-off for 2017.

Pinnacle Award Task Force Update

The new **SPE Pinnacle Award** is for recognition for delivering value to our customers.

Recognize Impact

The pinnacle awards will be re-designed as five awards so awards emphasize an important member value proposition. These awards are:

1. Pinnacle Outreach, 2. Pinnacle Education, 3. Pinnacle Communication, 4. Pinnacle Programming and 5. Pinnacle Students/New Generation – NG

Each can be earned (once) any time during a calendar/ANTEC year

Raise the Bar for Presentation

Section and Division should present the Pinnacle Awards at the local venues (board meetings, TPOCONS, student chapters) and Recognize at ANTEC annually, to increase local awareness, participation and attendance.

The New CEO

Patrick Farrey will succeed Wim De Vos who will step down in June.

Farrey comes to SPE after a 23-year career in the publication and association management sector. As Vice President at Kellen, a U.S. association management firm, he supported several associations and was the acting Executive Director for some of them.

Committee Reports, CCOW – Sandra McClelland

Sandra discussed student chapters, proposal to update SPE mission, election process and how to increase ANTEC attendance. Len Czuba discussed about increasing attendance for ANTEC. Discount for Section and Division Board members to attend the ANTEC was proposed. EB will decide. CCOW will not push mission this time. It was concluded that electronic voting is best way and continue the way we are doing.

Sections Committee – M. Verheij

Discussed about Akron Section Expansion, it will have moved territory section.

Divisions Committee

Building and Infrastructure Division-in-Formation, eliminated six divisions in 2016-2017. Creig Bowland, new vice-president of division wants to make sure he becomes resource for all divisions.

Election of CCOW Chair

Mridula Kapur will be next CCOW chair as per results of election conducted.

SPE 3-Year Operating Plan

This 3-year Operating Plan was created through an integrated effort of SPE Volunteers and Staff to describe the scope and rationale for current and future SPE initiatives. With this in mind, 3-year Operating Plan will provide everyone with: awareness of Society wide initiatives, guidance for specific programs, and a basis to measure our performance. The plan will be subject to regular, periodic review to ensure continued suitability.

The following factors were selected for consideration during this planning cycle. While there are literally dozens of possible factors to consider, these factors were chosen because of their magnitude of impact or near-term implications to SPE.

1. Access to information continues to be the single most important factor impacting our future strategies.
2. The continued evolution of our Industry has created a thirst for knowledge.
3. Historically, Conferences have been an important, effective, and profitable. Today, SPE and other professional organizations, are facing increased competition around the world from for-profit organizations.
4. Printed publications face unprecedented challenges due to changes in the manner in which people access, disseminate, and exchange information.
5. Volunteerism is the life blood of SPE.

Actions

The following actions have been identified as part of our planning process.

1. New additional revenues will be necessary to offset lower membership dues.
2. Continued and regular investments in our infrastructure and related resources.

3. Sharing of resources between SPE HQ and Chapters will become increasingly important.
4. Data driven decisions should replace decisions based solely on loose assumptions or emotions.
5. The expanded use of Task Forces and rationalization of existing committees
6. Internationalization – challenges

2017 Update

Additional qualified efforts are now required to retain membership and grow dues again. The Chapters with support of SPE HQ should make continue to exert maximum efforts to attract new members with our Society's value propositions communicated in a tailored and focused marketing approach.

Update on Bylaws and Policies

No more report. Updated information is on website.

Other Important Discussion

- Effective execution of our new Governance Model just started.
- Russell Broome discussed joint conference with others and special interest group. The information is available on website (Events)
<http://www.4spe.org/Events/index.aspx?navItemNumber=631>
- SPE HQs can help divisions and sections to blast all information to e-members.
- SPE has centralized email deployment – 38 sections, 24 divisions and 7 SIGs.
- The i-chain provides easy connectivity with other professionals. Automotive division is not there, while Detroit section is there.
– <https://thechain.4spe.org/home>
- We have approximate 11, 000 paid members
- “Plastics Insight” on website provides updated industry and technical news.
– <http://www.4spe.myindustrytracker.com/en/top>
– Technical Library <http://www.4spe.org/Resources/technicalresources.aspx?navItemNumber=657>
- There was very good support from divisions and sections for student activities @ANTEC. Names were announced. We contributed \$2,500.

CEO Farewell

Outgoing CEO Wim De Vos gave excellent speech on path to recovery and 3-yr plan and wish all of us great success.

The meeting was adjourned by President Rael AlZubi.

The next Council Meeting will be August 25-26, at the Marriot Renaissance Center, Detroit, Michigan.



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| Contest Hole | \$1000. USD | 1 foursome, signage, flag & more |
| Hole | \$750. USD | 1 foursome & signage |
| Lunch | \$2000. USD | 2 foursomes, signage & 100 fliers printed & distributed at the event promoting sponsoring company or its products |
| Dinner | \$3000. USD | 3 foursomes, signage, company message / logo on dinner table centerpieces, 100 fliers printed & distributed at the event promoting sponsoring company or its products |

<http://speautomotive.com/golf>

Sponsorship Chair: Teri Chouinard, Intuit Group
Ph: +1.248.701.8003 or e-mail: teri@intuitgroup.com

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Cost:

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\$125. USD / Player

Program:

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10:00 am – Shotgun Start
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3:30 pm – Buffet Dinner
4:00 pm – Awards & Prizes



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EDUCATION REPORT

by Bonnie Bennyhoff,
SPE Automotive Division Treasurer

Bonnie Bennyhoff participated as proxy for **Monica Prokopysheh**



Explorathon is a day of interactive workshops with female scientists, mathematicians, engineers and health care professionals designed to expand the horizons for girls in Science, Technology, Engineering and Mathematics.

Presented by the American Association of University Women Birmingham Branch (AAUW) in partnership with Cranbrook Institute of Science and Cranbrook Kingswood Middle School for Girls, and with generous support from the Ford Motor Company Fund, Explorathon 2017 was held on March 22nd. More than 400 female students in grades 9-12 participated in 21 different workshops.

The Automotive Division's workshop, "Chemistry and Designing with Plastics", was led by Elizabeth Egan from the SPE PlastiVan program, with help from Automotive Division member Bonnie Bennyhoff and Ford engineer, Elizabeth Johnston-Tengler. Each of our 3 workshops was filled to capacity with very high ratings in the post session surveys. It was so rewarding to see the students' interest level rise as the instructor led them through the history of plastic and the endless possibilities of how they can be used today. We talked about career opportunities and our own personal experiences to encourage them to think about choosing a career in plastics. We will definitely commit to doing this again!

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Technical Report

Chemical Resistance of PMMA, ASA and ASA+PC Materials Used in Automotive Exterior Trim Applications

Tom Pickett, *Materials Engineer, General Motors*

Abstract

This paper examines the chemical resistance of different grades of Polymethylmethacrylate material (PMMA), Acrylonitrile Styrene Acrylate (ASA) and Acrylonitrile Styrene Acrylate Polycarbonate (ASA+PC) that are commonly used in automotive exterior trim applications. The materials were exposed to automotive windshield washer solvent at different levels of strain.

Introduction

Automotive exterior trim parts are exposed to harsh exterior environmental elements. Exterior parts on the vehicle are exposed to ultra violet (UV) light, acid rain, blowing sand and dirt, temperature extremes of 95 °C to -40 °C, and chemicals.

When certain plastic materials are exposed to certain chemicals under different levels of strain, it can cause crazing and cracking that is referred to as environmental stress cracking (ESC). ESC is the leading mechanism of plastic component failure (1). ESC accounts for an estimated 15 – 30% of all plastic component failures in service (2). Thus, environmental stress crack resistance (ESCR) of a material exposed to different chemicals is important to know.

Environmental Stress Cracking

ESC is the initiation of cracking and embrittlement of plastic. ESC occurs on certain plastics when under certain levels of strain and exposed to certain chemicals for a certain length of time and at a certain temperature. With ESC, the crazing and cracking is caused by the combined action of the strain and exposure to chemicals.

Certain Materials

PMMA, ASA and ASA+PC materials are commonly used for automotive exterior trim applications. These materials are often used to replace painted and hard coated parts as OEMs look to reduce cost. Unlike painted or hard coated plastics, these materials are mold in color and exposed to chemicals. Thus, these materials must have good ESCR to the many chemicals they encounter when used in automotive exterior trim applications.

PMMA is used for automotive exterior appliques and lighting lenses. ASA and ASA+PC are used in exterior automotive pillar appliques, mirror shell housings, fender vents, hood vents, grilles, fog lamp bezels, roof ditch moldings and luggage rack end caps.

In this study, specific grades of each of these materials were evaluated for ESCR. Six different grades of PMMA with different levels of impact were tested. In addition, two different grades of ASA+PC with a high and low amount of PC were evaluated. Also three different grades of ASA were tested. A hard coated polycarbonate was selected as the control material. See *Table 1: Materials Evaluated*.

Certain Chemicals

There are many potential chemicals that come in contact with automotive exterior trim parts. There are numerous cleaning



TOM PICKETT

Tom Pickett is a Materials Engineer at General Motors responsible for Exterior Automotive Trim. Tom has over 30 years at GM in various functions: Plastics Development Engineer, Manufacturing Engineer, Plastics Process Engineer and Plastics Materials Engineer. He holds several patents, trade secrets and defensive publications related to plastic materials and processing. Tom is an active member of the SPE Automotive Division and Detroit Section and has held various positions on the SPE Board and Committees. Tom has a BA in chemistry from the College of the Holy Cross, a Masters of Science in Plastics Engineering from the University of Massachusetts at Lowell and a Masters of Business Administration from the University of Detroit-Mercy.

agents used to clean the exterior of the vehicle. Moreover, many exterior parts are positioned on the vehicle where they are exposed to windshield washer solvent. There is an increasing use of windshield washer solvent used not only for cleaning front and rear windshields, but also used to clean exterior camera lenses and lighting lenses.

In North America windshield washer solvent is a mixture of methanol and water. GM recommends windshield washer fluid of 40% Optikleen and 60% water per 9985670 (3). Optikleen composition percentage by mass is 99.70% methanol, 0.29% corrosion inhibitor (Monacore BE), 0.01% dye (4). In Europe windshield washer fluid is a mixture of isopropanol and water. This study examines the chemical resistance of PMMA, ASA and ASA+PC to wind shield washer solvent of 40% methanol and 60% water.

Certain Strain, Time, Temp

In this study, the materials were evaluated to windshield washer solvent at 0.5%, 1%, 1.5% and 2% strains. A fixed strain apparatus referenced in ASTM D543 was used to apply a strain to tensile bars of each material (5). Samples were tested at Room Temperature and checked after 1, 4 and 24 hours.

Chemical Resistance Testing

The GM test procedure, GMW15790 Evaluating the Resistance of Plastics to Chemical Reagents, (formerly GM9308P), was used (6). Test samples per ASTM D638, Type 1 tensile bars of 3.2 mm thick, 216 mm long injection molded according to ASTM D1897 of each material were tested. All tensile bar test samples were annealed (3 hours at 85 C) to remove any stress. The tensile bars were then placed on the strain gage under specific levels of strain of 0.5%, 1.0%, 1.5% and 2.0%.

Why evaluate under different strains? Although a part is annealed to reduce the amount of strain in the part, additional strain can be placed on the part when it is assembled to the vehicle. The amount of strain on the material effects the stress crack resistance. In this study, three tensile bars of each material were evaluated for each strain exposed to three drops of windshield washer solution. The samples were not submerged or wet packed (cheese cloth) with windshield washer fluid. The windshield washer solution of 40% Optikleen and 60% water was used.

Evaluation

The surface of the samples tested to GMW15790 were visually evaluated after exposure to windshield washer solution. The samples were evaluated up to 24 hours. The samples were ranked best to worst using the following criteria: 1) OK No Craze 2) Slight Craze 3) Noticeable Craze 4) Severe Craze 5) Split.

Results

At 0.5% strain with 40/60 Optikleen/Water solution, the coated PC, ASA and ASA+PC were OK No Craze. PMMA samples were OK No Craze except for one grade of PMMA had slight craze on the edge of sample. See *Table 2: Chemical Resistance to 40 /60 Optikleen / Water at 0.5% Strain.*

At 1% Strain with 40/60 Optikleen/Water solution, the coated PC, ASA and ASA+PC were OK No Craze. Four grades of PMMA were OK. Two grades of PMMA had slight craze on the edge of sample after four hours of exposure. One of these two grades of PMMA had noticeable craze after 24 hours of exposure. The two grades of PMMA that exhibited craze were from the same resin manufacturer. See *Table 3: Chemical Resistance to 40 /60 Optikleen / Water at 1.0% Strain.*

At 1.5% Strain with 40/60 Optikleen/Water solution, the hard coated PC exhibited cracks in the hard coat even before exposure to windshield washer solution. Four grades of PMMA had either slight craze, noticeable craze or split. The standard grade of ASA high UV black exhibited slight craze. The ASA+PC with high PC content exhibited slight craze. ASA+PC (low PC) and ASA (high UV, white color) were OK No Craze. See *Table 4: Chemical Resistance to 40 /60 Optikleen / Water at 1.5% Strain.*

At 2% Strain with 40/60 Optikleen/Water solution, the hard coated PC exhibited cracks in the hard coat even before exposure to windshield washer solution. All six grades of PMMA split except one had severe craze. The standard grade of ASA and the ASA high UV black exhibited slight craze. The ASA+PC with high PC content exhibited slight craze. ASA+PC (low PC) and ASA (high UV, white color) were OK No Craze. The ASA high UV black and the ASA high UV white had the same chemistry except different pigment. Why did the white perform better? One explanation was the white color made it harder to see the stress cracks and craze compared to the black color. Unfortunately, the samples were not retained after testing to be able to review again. See *Table 5: Chemical Resistance to 40 /60 Optikleen / Water at 2% Strain.*

Conclusion

The environmental stress crack resistance of PMMA, ASA and ASA+PC to windshield washer solvent of 40 / 60 Optikleen / water were evaluated at 0.5%, 1.0%, 1.5% and 2% strain levels. As expected, more crazing and even some cracking occurred as strain levels increased. Ranking the materials tested to windshield washer solvent under these certain conditions, from best to worst, are hard coat PC, ASA+PC (low PC), ASA (high UV), ASA (standard), ASA+PC (high PC) and PMMA. Interestingly, our benchmark material, the hard coated PC, had hard coat cracking at 1.5% strain which was related to the brittleness of the hard coat and not the chemical exposure.

Table 1: Materials Evaluated

| # | Sample ID | Description |
|----|----------------|-------------------------------------|
| 1 | Impact Acrylic | Impact |
| 2 | Impact Acrylic | Impact |
| 3 | Acrylic | Standard |
| 4 | Impact Acrylic | Impact |
| 5 | Impact Acrylic | Impact, Exterior Lens |
| 6 | Acrylic | Medium Impact Modified, Weatherable |
| 7 | Coated PC | Hard Coat PC |
| 8 | ASA+PC | High PC |
| 9 | ASA+PC | Low PC |
| 10 | ASA | High UV, white |
| 11 | ASA | Standard |
| 12 | ASA | High UV, black |

Table 2: Chemical Resistance to 40 /60 Optikleen / Water at 0.5% Strain

| Sample ID | 1 H | 4 H | 24 H |
|-----------------------------------|-----|-----|--------------|
| 1. Impact Acrylic | OK | OK | OK |
| 2. Impact Acrylic | OK | OK | OK |
| 3. Acrylic | OK | OK | OK |
| 4. Impact Acrylic | OK | OK | OK |
| 5. Impact Acrylic | OK | OK | OK |
| 6. Acrylic | OK | OK | Slight Craze |
| 7. Coated PC | OK | OK | OK |
| 8. ASA+ PC (High PC) | OK | OK | OK |
| 9. ASA+PC (Low PC) | OK | OK | OK |
| 10. ASA (High UV Resistant White) | OK | OK | OK |
| 11. ASA (Standard) | OK | OK | OK |
| 12. ASA (High UV Resistant Black) | OK | OK | OK |

Table 3: Chemical Resistance to 40 /60 Optikleen / Water at 1.0% Strain

| Sample ID | 1 H | 4 H | 24 H |
|-----------------------------------|-----|--------------|------------------|
| 1. Impact Acrylic | OK | OK | OK |
| 2. Impact Acrylic | OK | OK | OK |
| 3. Acrylic | OK | OK | OK |
| 4. Impact Acrylic | OK | OK | OK |
| 5. Impact Acrylic | OK | Slight Craze | Slight Craze |
| 6. Acrylic | OK | Slight Craze | Noticeable Craze |
| 7. Coated PC | OK | OK | OK |
| 8. ASA+ PC (High PC) | OK | OK | OK |
| 9. ASA+PC (Low PC) | OK | OK | OK |
| 10. ASA (High UV Resistant White) | OK | OK | OK |
| 11. ASA (Standard) | OK | OK | OK |
| 12. ASA (High UV Resistant Black) | OK | OK | OK |

Table 4: Chemical Resistance to 40 /60 Optikleen / Water at 1.5% Strain

| Sample ID | 1 H | 4 H | 24 H |
|-----------------------------------|-------------------|-------------------|-------------------|
| 1. Impact Acrylic | OK | OK | OK |
| 2. Impact Acrylic | OK | OK | OK |
| 3. Acrylic | OK | OK | Slight Craze |
| 4. Impact Acrylic | OK | OK | Slight Craze |
| 5. Impact Acrylic | OK | Split | Split |
| 6. Acrylic | Noticeable Craze | Noticeable Craze | Noticeable Craze |
| 7. Coated PC | Hard Coat Cracked | Hard Coat Cracked | Hard Coat Cracked |
| 8. ASA+ PC (High PC) | OK | OK | Slight Craze |
| 9. ASA+PC (Low PC) | OK | OK | OK |
| 10. ASA (High UV Resistant White) | OK | OK | OK |
| 11. ASA (Standard) | Slight Craze | Slight Craze | OK |
| 12. ASA (High UV Resistant Black) | OK | OK | OK |

Table 5: Chemical Resistance to 40 /60 Optikleen / Water at 2% Strain

| Sample ID | 1 H | 4 H | 24 H |
|-----------------------------------|-------------------|-------------------|-------------------|
| 1. Impact Acrylic | Slight Craze | Split | Split |
| 2. Impact Acrylic | OK | Severe Craze | Split |
| 3. Acrylic | Slight Craze | Split | Split |
| 4. Impact Acrylic | Slight Craze | Severe Craze | Severe Craze |
| 5. Impact Acrylic | Split | Split | Split |
| 6. Acrylic | Split | Split | Split |
| 7. Coated PC | Hard Coat Cracked | Hard Coat Cracked | Hard Coat Cracked |
| 8. ASA+ PC (High PC) | OK | Noticeable Craze | Noticeable Craze |
| 9. ASA+PC (Low PC) | OK | OK | OK |
| 10. ASA (High UV Resistant White) | OK | OK | OK |
| 11. ASA (Standard) | OK | OK | Slight Craze |
| 12. ASA (High UV Resistant Black) | Slight Craze | Slight Craze | Slight Craze |

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INTERSOCIETY REPORT

by Dhanendra Nagwanshi,
SPE Automotive Division Intersociety Chair



I was one of 12,000 industry professionals who attended the SAE World Congress Experience (WCX17) in Detroit, held at Cobo Center April 4-6. This is SAE International's signature event, once known as the SAE World Congress – and it is under reinvention.

The event has created some new opportunities for OEMs and technology companies to come together, providing the setting for more networking, learning and collaboration.

This was the place to be in Detroit over those three days, with the presence of industry leaders and some of the brightest minds from the technical community. About a quarter of the attendees came from the OEM community, with an even larger share from the supply base. Up to 200 exhibitors were present, from the OEMs and part/system suppliers to those providing engineering tools, products and services.

Among those industry leaders speaking at the event were Anthony Foxx, former U.S. Secretary of Transportation, and Raj Nair, executive vice president, product development, and CTO, Ford Motor Company.

What has not changed is the strength of the technical program, which was very robust with seven tracks (from design and manufacturing, and materials to safety and powertrain) that featured 250 technical sessions, 12 technical expert panels and 1,500 technical presentations.

Representing the SPE Automotive Division, I delivered a technical keynote on thermoplastic composite hybrid solutions in support of vehicle weight reduction. We see a substantial interest in the use of mixed materials to shed pounds.

With inspiration from WCX17, I invite you to share your ideas on how we at the SPE Automotive Division can work in new and innovative ways with other societies and the larger industry community of which we are a part. After all, in the words of Henry Ford: "Coming together is a beginning; keep together is progress; working together is success."



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Technical Report

Introduction to the usage of Thermally Conductive Thermoplastic Compounds in Applications Requiring Heat Dissipation

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Abstract

Thermally Conductive (TC) thermoplastic compounds provide innovative solutions to overcome heat management issues in applications such as automotive lighting, electric motors and electronics. Despite the low thermal conductivity compared to metals that are commonly used in heat sinks, TC compounds offer weight and potential cost savings which are desirable for automotive applications. Furthermore, they can often replace regular thermoplastics and bring additional benefits when used in components that are exposed to heat. To drive the usage of TC compounds to their full potential, consideration given to the balance between overall physical, electrical, mechanical and thermal properties is critical, and an accurate prediction of thermal performance is needed. A good correlation between simulation and empirical measurements was observed in the validation of the predictive model for thermal performance of a plastic heatsink using Acusolve™.

Introduction

LEDs, electric motors and electronics are products that may benefit from heat dissipation. For instance, most LED manufacturers publish curves showing light output as a function of junction temperature, which is dependent on ambient temperature, electrical current and amount of heat sinking material in the system.

Quickly taking over halogenated and xenon lighting technologies in automotive, LEDs yield longer lifetimes when junction temperatures are lower. Die-cast Aluminum heatsinks are widely used to pull the heat away from LEDs and electronics; however, designers are increasingly looking for alternative materials that can provide greater design freedom and lower weight, without compromising performance. Thermally Conductive (TC) thermoplastics may offer suitable solutions for engineering components as an alternative to metals and in other cases, to regular plastics.

Exterior lighting components are often exposed to heat and sun load. As a result of the increasing temperature, plastic parts may soften, deform or outgas, compromising the aesthetics and/or functionality of the entire assembly. With the ability to dissipate thermal energy, the usage of TC compounds may provide design flexibility to eliminate the need for heat shields, reflective coatings or higher temperature resistant/higher priced materials.

Most thermoplastics are good thermal insulators. With the addition of highly conductive fillers the thermal conductivity of the compound can be raised to levels sufficient to transport of thermal energy through the material. A simplified way to look at the theory of heat conduction is one dimensional Fourier's Law for steady state (eq. 1), where ΔT is the temperature gradient between the surfaces [K], \dot{q}_{in} is the heat flux [W/m^2], d is the thickness or thermal path [m] and λ is the thermal conductivity of the material [W/mK].



PAULA KRUGER

Paula Kruger, Application Development Engineer at DSM Engineering Plastics, Inc., concentrates on the field of automotive lighting, electrical and electronics. Ms. Kruger has over 10 years of experience in research and development of thermoplastic materials and applications. Since joining DSM in 2013, she works with thermally conductive plastics and recently presented her work at AutoEPCON 2017.

Originally from Brazil, Ms. Kruger holds a B.S. degree from Universidade Federal do Rio Grande do Sul (RS, Brazil) and a M.S. degree from the Department of Chemical Engineering at University of Waterloo (ON, Canada). She began her career working on natural fiber composites for automotive industry and plastic materials for consumer electronics.

The temperature gradient is directly proportional to the thickness of the wall and inversely proportional to the thermal conductivity of the material. For thermal conductivity values in the range of 0.1 to 0.5 W/mK, the wall thickness has a significant impact on the temperature gradient. As λ increases, the temperature gradients for different wall thicknesses approach zero. From this point on, to continue to transfer heat through the part, a new temperature gradient must be created. Heat dissipation becomes limited by convection (Figure 2).

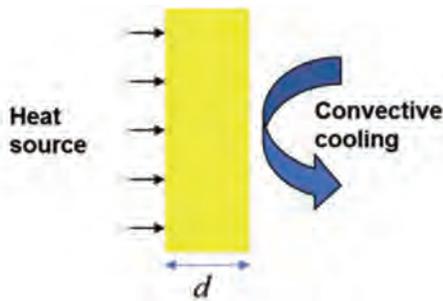


Figure 1. One direction heat transfer representation.

$$\Delta T = -\frac{\dot{q}_m d}{\lambda} \text{ (eq.1)}$$

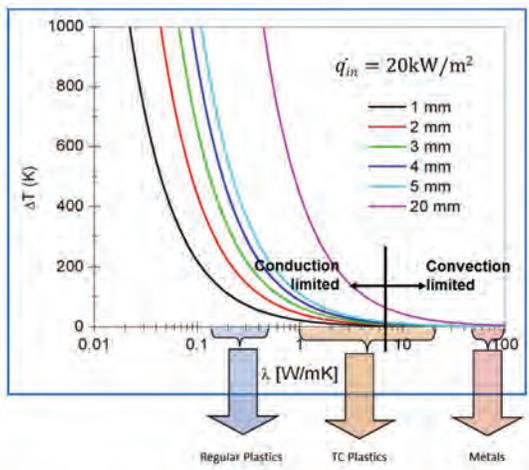


Figure 2. Temperature gradient variation as a function of lambda, for a constant heat flux.

To make a shorter and more streamlined development cycle, driving the usage of TC compounds to their full potential, accurate prediction of thermal performance is needed. DSM Engineering Plastics implemented Acusolve™, a CFD based software, along with other valuable CAE tools for modeling heat dissipation. A prototype heatsink was built to validate the predictive model for the steady state condition. In this prototype, a PCB containing 3 LEDs, each one generating 1.4W of heat, was attached to a TC plastic heatsink with thermal conductivity of 14W/mK in parallel direction.

The predictive model for heat dissipation took into consideration all relevant heat transfer mechanisms: conduction, convection and radiation. For many natural convection problems, the heat loss to the environment by radiation may be significant, as opposed to forced convection situations. In the problem considered here, heat loss by radiation is approximately 1/3 of the total heat loss to the environment. Fin-to-fin spacing is critical to avoid radiation and air flow stagnation between fins.

In this model, a high number of finite elements nearby the heatsink was used to capture every small change in temperature. As air heats up, its density decreases due to the increased volume, causing it to move up. A tool that couples the heat loss to the air flow around the heat sink was used to model heat loss by natural convection.

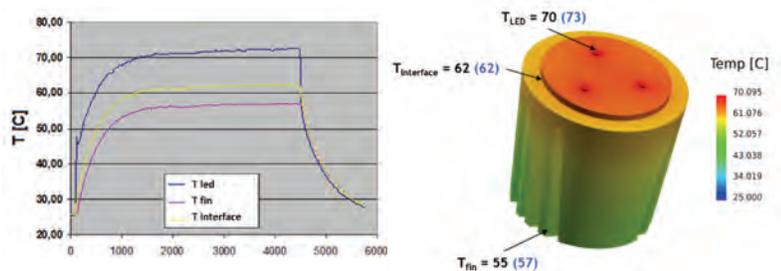


Figure 3. Prototype empirical and predicted temperatures.

Thermocouples were used at three different locations (LED, interface between heatsink and PCB, heatsink fin) to monitor temperatures. After approximately one hour the steady-state temperature distribution was reached. The predicted values were highly correlated to the measured values (Figure 3).

While high thermal conductivity is often desired to promote high heat dissipation throughout the part, it is important to consider the balance of physical, electrical, mechanical and thermal properties in the final product. Polymer matrix plays an important role as it relates to moisture absorption, dimensional stability and outgassing. Combined with the polymer, fillers typically used to increase thermal conductivity have a major effect on the mechanical properties of the compound. Small elongation at break values and brittleness are challenging for most designs. Some of these fillers may also increase electrical conductivity in the material, usually observed as a decrease in volume resistivity and dielectric strength.

A proper balance of properties and accurate assessment of heat dissipation performance makes it possible the usage of TC plastics to be efficient solutions in overcoming stringent application requirements.



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