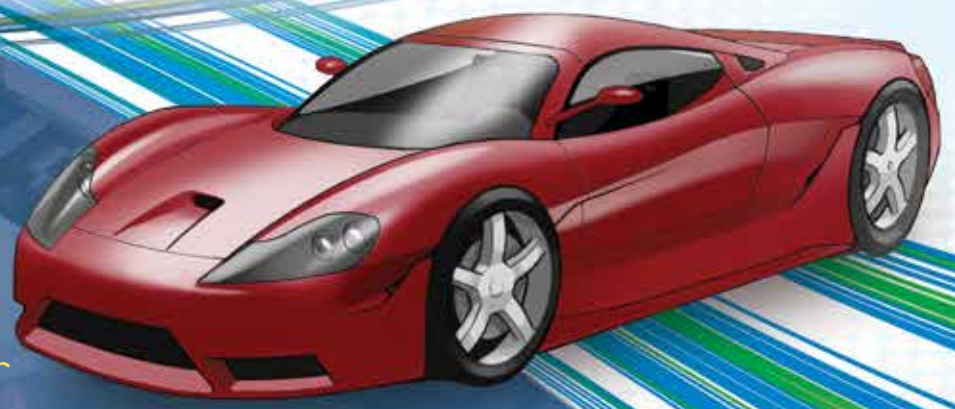
AUTOMOTIVE PLASTICS News
A PUBLICATION OF THE AUTOMOTIVE DIVISION OF THE SOCIETY OF PLASTICS ENGINEERS



2013 SPE® ACCE Set for Another Record-Breaking Year

by Creig Bowland, PPG Industries &
Antony Dodworth, Dodworth Design,
2013 SPE ACCE Co-Chairs

SEPT 2013
VOLUME 43, ISSUE 1

It's almost mid-September

and that means the ***SPE Automotive Composites Conference & Exhibition*** (ACCE) is upon us once again. Co-organized by members of SPE's Automotive and Composites Divisions since 2001, the event is in its 13th year and looks to be the largest yet. With over 700 attendees expected, this year's conference sports a significantly expanded technical program, a record number of sponsors and exhibitors, the largest student poster competition to date, an expanded parts competition, a new event app, and much more.

AUTOMOTIVE COMPOSITES CONFERENCE & EXHIBITION
World's Leading Automotive Composites Forum
SOCIETY OF PLASTICS ENGINEERS
AUTOMOTIVE & COMPOSITES DIVISIONS

BIGGER TECHNICAL PROGRAM

Before this year, the SPE ACCE's largest technical program had featured 68 regular papers, but in 2013 there are 91 scheduled over the event's three days (see the latest schedule at http://speautomotive.com/comp).

For the first time in the conference's history, organizers had to go to four parallel tracks all of Day 1 and half of Day 2. That's a big increase in technical content even though attendance fees have not changed — it's still $375 USD for SPE members and $475 USD for non-members (the latter including 1 year of SPE membership for free). It's also a testament to the increased interest in composite materials and processing technologies among automakers, which are starting to recognize how composites can significantly reduce component mass and tooling and finishing costs, while reducing corrosion and denting, and greatly expanding decorative options, parts consolidation, and complex design opportunities.

New this year is an entire Tutorials technical track that features over 7 hours of programming on a variety of topics including: *Introduction to Thermoplastic & Thermoset Composite Processing Methods, Fiberglass Reinforcement Sizing 101, A Short History of Automotive Composites, Dry Fiber Preforming Methods - Pros and Cons, Repair of Advanced Composite Structures, Design & Development of Precision Plastic Gear Transmissions,* and *Developing Accurate Material Models for Composites.* Attendees interested in this day-and-a-half session should note that it will be filmed. By walking into the room to watch any of the tutorials, you are consenting to have your likeness and your voice recorded for posterity.

The ACCE is well known for the diversity of its keynote speakers and this year's event is no exception. First day's lunch features Greg Rucks, senior consultant, Rocky Mountain Institute (RMI) giving a talk entitled *The Autocomposites Commercialization Launchpad: Kickstarting Mainstream Adoption of Automotive CF Composites*. Later that afternoon, just before our panel discussion, Mario Greco, growth & market strategy, Alcoa, Inc. will discuss the topic of *The Multimaterial Reality*. During lunch on the second day, the topic of *Industrialization of Carbon Fiber Composites – Lessons Learned, Investment Priorities for the Future* will be presented by Jai Venkatesan, director-Material Science & Engineering at The Dow Chemical Co. Later that afternoon, two back-to-back keynotes will be presented by Elias Shakour, research scientist-Manufacturing,

Continued on Page 4

CONTENTS

AUTOMOTIVE DIVISION MEETING SCHEDULE & SPECIAL EVENTS CALENDAR

13th-Annual SPE Automotive Composites Conference & Exhibition (ACCE)

Diamond Center — ALL DAY
Novi, MI USA — Sept. 11-13, 2013

First Round - Automotive Innovation Awards Judging

Ticona Engineering Polymers, — 8:00 am- 5:00 pm
Auburn Hills, MI USA — Sept. 26-27, 2013

15th-Annual TPO Automotive Engineered Polyolefins Conference

Troy Marriott — ALL DAY
Troy, MI — Oct. 6-9, 2013

Second Round / Blue Ribbon - Automotive Innovation Awards Judging

Ticona Engineering Polymers, — 8:00 am- 5:00 pm
Auburn Hills, MI USA — Oct. 7, 2013

Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. — 5:30 - 7:30 pm
Troy, MI USA — Oct. 28, 2013

43rd-Annual Innovation Awards Gala

Burton Manor — 5 - 11 pm
Livonia, MI — Nov. 6, 2013

Auto. Div. Board Meeting

American Chemistry Council - Auto. Ctr. — 5:30 - 7:30 pm
Troy, MI USA — Dec. 9, 2013

Automotive Division Board of Directors meetings are open to all SPE members. All events are listed on our website at http: speautomotive.com/ec
Call Jeffrey Helms at 248.377.6895 for more information.

CHAIR'S MESSAGE

by Yvonne Bankowski, SPE Automotive Division Chair

Greetings My name is Yvonne Bankowski and I am 2013-2014 chair for the Automotive Division of the Society of Plastics Engineers. Over the last 4 years on this board, I have served as the treasurer, vice-chair, and chair-elect before assuming my current role. In my day job, I have worked at Ford Motor Co. for the last 14 years in Materials Engineering and Testing and have focused mainly on resins for vehicle interiors.

I would like to thank the members of our board who will be continuing their hard work and contributions to our division. I would also like to welcome new members who have recently joined the SPE Automotive Division and already volunteered to serve as officers and committee chairs. Vincent Holmes from Wellman Engineering has moved up to the position of chair-elect. For the vice-chair position, we have a new member, Elias Shakour from the Center for Automotive Research (CAR). Jackie Rehkopf of Plasan Composites will continue her role as treasurer and Monica Prokopyshan (Chrysler-retired) will continue as secretary and education chair. Plus, our councilor, Tom Pickett continues to represent the Automotive Division at meetings held by SPE International, which rounds out our officers. For committee chairs, Fred Deans continues as golf (outing) chair for life, Teri Chouinard continues as sponsorship and social chair, and Anthony Gasbarro as ANTEC chair. Our immediate past-chair, Jeff Helms continues on as Innovation Awards chair, and Peggy Malnati will remain communications chair, webmaster, and newsletter editor. I welcome a new member to our board, Steve VanLoozen, BASF who has volunteered to chair the membership committee. Without the work and commitment of our volunteers, the Division would not be able to perform its function and serve our membership.

As usual, the next 3 months are very busy for the Automotive Division. We have numerous opportunities for technical and social events and look forward to seeing our members and potential new members at these events. The SPE Automotive Div. Annual Golf Outing returns to the Fieldstone Golf Club in Auburn Hills, Michigan on Monday, September 9th, 2013. More information can be found at http://www.speautomotive.com/golf.htm.

On September 11th, the 13th-annual Automotive Composites Conference and Exhibition begins. Please note that this full 3-day conference will take place in a new location this year: The Diamond Banquet & Conference Center at the Suburban Collection Showplace in Novi, Michigan. This event is jointly sponsored by SPE's Automotive and Composites Divisions and more information can be found at http://www.speautomotive.com/comp.htm and in the lead story in this issue of our newsletter.

On Thursday September 19th from 4-9 pm, we are planning a social event at the Buick Gallery in the Sloan Museum in Flint, Michigan. We will be touring the "Corvettes from 0 to 60" exhibit, and this will be an opportunity for students from nearby Kettering University and University of Michigan-Flint to meet and network with our members.

In October, we encourage you to attend the 15th-annual SPE Automotive TPO Engineered Polyolefins Conference, which is sponsored by the SPE Detroit Section. It takes place October 6-9 at the Troy Marriott in Troy, Michigan. For additional information, go to http://www.auto-tpo.com.

And finally, on November 6th, the Automotive Division puts on its 43rd-annual Automotive Innovation Awards Gala. I often refer to this event as the "Oscars® for Plastics" and it's a great opportunity to see the latest innovations in automotive plastic design, processes, and materials. If you have not done so already, please take the time to submit a nomination for our parts competition and encourage your colleagues to do the same. The deadline is fast approaching. The nomination forms and submittal information can be found at http://www.speautomotive.com/inno.htm.

I look forward to a great year as chair of the Automotive Division and, again, I thank all those who volunteer their time to help our division.

Best regards,

Yvonne Bankowski

SPE Automotive Div.
Ford Motor Co.

ACCE CONTINUED FROM PAGE 1

Engineering & Technology at the Center for Automotive Research on *Creating Value through Collaboration* and by Ray Boeman, program director-Energy Partnership, Oak Ridge National Laboratory on *The National Advanced Composites Manufacturing Institute – a Consortium Approach to Automotive Composites*. The conference's final day will also feature two back-to-back keynotes during lunch. Martin Starkey, managing director, Gurit Automotive Ltd. will lead off with a talk on *A Class Surface Composites: from Niche Production to Advancing Materials for Higher Volume OEMs*. Next up, Howard Coopmans, Viper project responsible, Street & Racing Technology (SRT), Chrysler Group LLC will discuss *Composite Technology Developments on the SRT Viper*.

Given the size of the technical program this year, there was only room for one of the ACCE's ever-lively panel discussions, which will be held late in the afternoon on Day 1 on the topic of *Aluminum & Composites: Compete or Collaborate?* The 90-minute panel will be moderated by Antony Dodworth, SPE ACCE co-chair and managing director, Dodworth Design. Confirmed panelists at press time include James E. deVries, manager, Global Materials and Manufacturing Research, Research & Advanced Engineering, Ford Motor Co.; Doug Richman, vice-president-Engineering and Technology, Kaiser Aluminum; and keynote speakers, Mario Greco; Martin Starkey; and Jai Venkatesan. ACCE panel discussions are not to be missed because during the last 30 minutes, audience members are allowed to ask panelists questions, which is when dialogue becomes really interesting.

VASTLY EXPANDED EXHIBITION

As reported in our June issue, SPE moved this year's ACCE show to a new-to-us facility in Novi, Michigan — The Diamond Banquet & Conference Center at the Suburban Collection Showplace — because we had outgrown our home of the previous 12 years and needed more space. We're happy to report that by mid-August we had completely filled the huge Crystal/Onyx Ballroom where all exhibits are showcased and where breakfasts, breaks, lunches, cocktail receptions, keynote speeches, and our panel discussion will be held. At press time, 90 sponsors and exhibitors had signed up to support the event, up significantly from last year.

EXPANDED PARTS COMPETITION

Over the past 5 years, exhibitors had been bringing more and larger parts to the show to display in their booths and in the event's Large Part Room. Last year, organizers decided to hold the show's first parts competition with a single award going to Asahi Kasei Plastics North America, Inc. for the 2012 6 ft 4 inch Dodge® Ram® RamBox® Cargo Management System, which was described as industry's first and largest injection-molded storage bin and twin-sheet thermoformed lid using high-performance glass-reinforced polypropylene. Since it was difficult picking just one winner, this year organizers expanded the competition to include both a *Vehicle Interior* and *Vehicle Exterior* award, which will be decided by members of the organizing committee, as well as a new *People's Choice Award*, which will be selected by attendees at the conference. Attendees will find an official ballot in their conference program guide on which they can write the name of their favorite part. Winners of all three awards will be announced during lunch on Friday, September 13th.

MORE STUDENTS, MORE OPPORTUNITIES TO MEET THE NEXT GENERATION OF AUTOMOTIVE COMPOSITES ENGINEERS

Since 2007, the SPE ACCE has offered graduate-level scholarships to fund student research in composites technologies deemed to have importance to automotive and ground-transportation applications. In fact, many of our previous scholarship award winners are today

ACCE CONTINUED FROM PAGE 4

working in the automotive composites field and are very involved in both SPE and the SPE ACCE. (You'll see them flagged on conference schedules.) We also have had a growing student poster competition for graduate and undergraduate students since 2008.

This year, the Michigan Economic Development Corp. stepped forward to fund our two traditional graduate scholarships plus a new Michigan-only scholarship. Winners of those awards are featured elsewhere in this issue. Last year's SPE ACCE scholarship winners will be reporting the results of their research in this year's conference in the Virtual Prototyping & Testing of Composites session and the Bio & Natural Fiber Composites session.

INVISTA Engineering Polymers also stepped forward to sponsor our student poster competition for 2013. This year's program features a record 30 technical topics to be presented by students from 18 schools. Winners of this year's competition will be announced during lunch on Day 2 and awards will be presented by an executive from INVISTA.

NEW EVENT APP

A fun new feature of this year's conference that launched on August 8th is a free event application (app) for smartphones, tablets, and other web-based devices. SPE International has negotiated for a branded event app that is more feature rich than the one that premiered at this year's SPE ANTEC and last year's National Plastics Exposition (NPE) co-organized by the Society of the Plastics Industry (SPI) and SPE.

For those with a Blackberry®, or accessing via the web, the event app's content can be found at http://spe.eventsential.org/Events/Details/22.

For those with an Android® phone or tablet or iPhone®/iPad®, please go to your app store and download the free app called *Eventsential.* Install it, open it, look under Organizations. When you see the SPE shield, click on the arrow to the right and it should open the very first SPE event in the new platform (under Upcoming Events): ACCE. Click on that logo, and it will take you to the conference schedule, where you'll find all our sessions and the schedule for each session (including rooms, speakers, mini-abstracts and speaker bios where available). The app lets you flag sessions you wish to attend throughout the 3-day event and then sync content with your personal calendars across your various devices.

To the top right is a series of 3 white horizontal lines that will take you to a table of contents from any page in the app. From there, you can learn more about our 90 exhibitors/sponsors — another record for 2013 — each of whom have a page of their own with their logo, links to their websites, contact details, their booth number at the ACCE (if exhibiting), and in most cases a short write up about what they offer. The app lets you flag sponsors you wish to visit during the show and later check off those that you have seen. A map icon to the top left brings up a map of the exhibition area where you can match booth numbers to exhibitors.

We hope the event app is a useful tool to preview content and help you decide if you wish to attend this year's SPE ACCE. Check back often as we will continue to update content as the show approaches.

OEMS STILL ATTEND FOR FREE

It's long been the policy of the SPE ACCE organizers and the SPE Automotive and Composites Div. boards that OEMs can attend the conference for free. If you work directly for a transportation OEM — whether automotive, truck, bus, recreation vehicles (RVs), off-highway, agricultural equipment, or even aerospace — just click on the OEM button when you register at http://attendacce.com/ and conference fees will be waived. If you work for a transportation OEM's tier supplier, please contact your local representative of our sponsors and exhibitors and see if they have a free ticket you can use. They want you to be there!

Our team of 37 conference organizers and reviewers has worked exceptionally hard this year soliciting paper topics, reviewing abstracts and papers or presentations, and preparing for the big event. We hope you'll come out to see what composites technology can offer transportation OEMs and their suppliers.

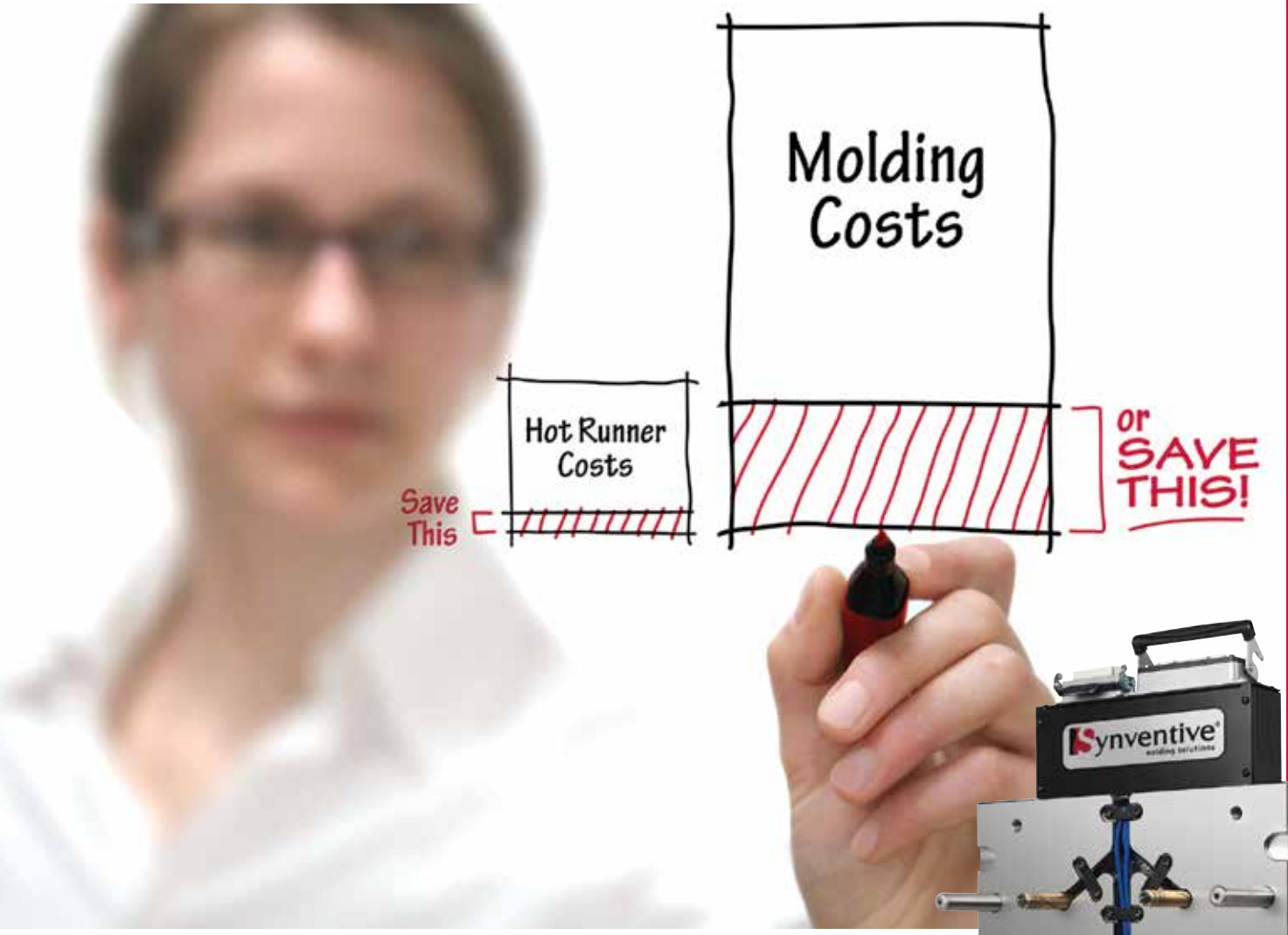
If you are attending, please let folks know via Twitter® (use **#2013SPEACCE**) and via LinkedIn® and Facebook®.

ABOUT THE SPE ACCE

Held annually in suburban Detroit, the ACCE draws over 700 speakers, exhibitors, sponsors, and attendees and provides an environment dedicated solely to discussion and networking about advances in the transportation composites. Its global appeal is evident in the diversity of exhibitors, speakers, and attendees who come to the conference from Europe, the Middle East, Africa, and Asia / Pacific as well as North America. Fully one-third of attendees indicate they work for automotive and light truck, agriculture, truck & bus, heavy truck, or aviation OEMs, and another 25% represent tier suppliers. Attendees also represent composite materials, processing equipment, additives, or reinforcement suppliers; trade associations, consultants, university and government labs; media; and investment bankers. The show has been jointly sponsored by the SPE Automotive and Composites Divisions since 2001.

Choosing a Hot Runner?

It's All About VALUE!



When it's time to choose your next hot runner system, don't cut corners. Sure, some systems cost less than others and you may save a little on your up-front tooling costs. ***BUT would you rather save a little on your tooling costs, or save SUBSTANTIALLY on your molding costs?***

Synventive's value proposition is this: we provide our customers with hot runner systems that improve their molding operations and save them substantially for the life of the tool. Better productivity, and a healthier bottom line for your company; good reasons to take a hard look at Synventive for your next hot runner application!

Synventive®
molding solutions

USA: 10 Centennial Drive, Peabody, MA 01960 • Tel: 978.750.8065 • info@synventive.com • www.synventive.com
Germany: Heimrodstraße 10, 64625 Bensheim • Tel: 49 (0)6251.9332.0
China: 12B Gang Tian Industrial Square, Suzhou Industrial Park, China 215021 • Tel: 86.512.6283.8870

When worlds collide . . .

by Jeff Sloan

I'm coming up on the end of my seventh year as editor of *Composites Technology* and *High-Performance Composites* magazines. Prior to that, I spent 10 years working as writer, editor and eventually publisher of *Injection Molding* magazine. On paper, my transition from the world of injection molding (mostly thermoplastics) to the injection or compression or pultrusion or whatever of thermosets and thermoplastics might have seemed trivial. Both industries consume a plastic of some sort and each overlaps the other in a few major end markets — automotive being the most major of them all.

What I learned, after about an hour into my new job back in September 2006, is that the difference between injection molding and composites is not only not trivial, but it is *significant*. And rare, it seemed, shall the twain meet.

For many years, this change of pace and environment was fine as I adjusted to the application of composites to aircraft and wind turbine blades and boat hulls and golf clubs and *Corvette* hoods. The last couple of years, however, have seen a gradual, inexorable, inevitable and potentially violent colliding of worlds as composites have threatened to go places no composites have gone before: Automotive structures.

It all started in April 2010 when, at the JEC composites show in Paris, I met a smart German man named Andreas Wüllner who had just been handed the reins of SGL Automotive Carbon Fibers, a joint venture of BMW Group and SGL Group. BMW, he told me, wanted to design and then build an all-electric car that features a passenger cell made entirely of carbon fiber. "A first," he said, smiling. A year later, I ran into Andreas again and asked him how the effort was going. "Well," he said, "but we are still getting used to the requirements of an automaker. It is very different."

The fruit of that carbon fiber effort is, as you probably know, the BMW *i3*, which was introduced to the world in late July. It's coming to market in Europe later this year, and then the U.S. in early 2014. And of course it appears that other carmakers are starting to follow suit, including GM, Volkswagen, Toyota, Ford, and more.

Jeff Sloan has been editor of *High-Performance Composites and Composites Technology* magazines for seven years.

Andreas' comment about the challenges serving a production carmaker back in 2011 has had me thinking since: Just how ready is the composites community to join the fast-paced, demanding world of high-volume automotive manufacturing? There are, as I see it, three hurdles to be cleared:

Capital equipment: Thermoplastic injection molding is, in many ways, an ideal process for high-volume automotive. It requires an injection molding machine, a well-built mold, and expertise in process setup and optimization. Once a mold and machine are well tuned, they can produce thousands of parts quickly and consistently to spec. Flaws, once introduced, often can be quickly troubleshot and solved. Conversely, in composites manufacturing there is no one composites machine. The manufacturing process used varies, depending on resin type, fiber type, tooling type, and application. You might employ resin transfer molding (RTM) or compression molding or infusion. You might use bulk molding compound (BMC), or sheet molding compound (SMC), or an epoxy or a thermoplastic polyester. Your mold might be steel, aluminum, or composite itself. And don't forget carbon or glass fiber. Or aramid. Or flax. Most automotive composites manufacturers are, it appears, leaning toward some derivation of compression molding or RTM for high-volume applications, but even development of those processes is varied, ranging from Plasan Carbon Composites' autoclave-ish Pressure Press to KraussMaffei/Dieffenbacher's high-pressure RTM.

Batter's Box CONTINUED FROM PAGE 8

Capacity: Even if one or more high-speed processes are developed that allow for the manufacture of automotive composite parts at high volumes, there is no guarantee that the composites industry itself has the human or physical capacity to accommodate the automotive industry's needs. Compared to just the injection molding industry, composites remains relatively small, used to managing processes for low-volume fabrication — that is, not cars. A boat hull takes weeks to mold. A wind turbine blade, in the very best of plants, takes a day. A wing for the Boeing *787* or the Airbus *A350 XWB* aircraft is made with a great deal of automation, but its shear size, coupled with extensive post-mold work and laborious inspection processes, makes it the antithesis of automotive manufacturing. The composites industry is chock full of well-trained, smart engineers, but even during the recession I heard stories of manufacturers who struggled to find qualified employees. If even a handful of the world's best carmakers woke up tomorrow and decided to start engineering a carbon fiber composite passenger cell similar to the one on the BMW *i3*, the composites industry would struggle to meet the demand. Because of this, carmakers might do as BMW did with the *i3* and take on the work of developing and operating new composites manufacturing processes themselves.

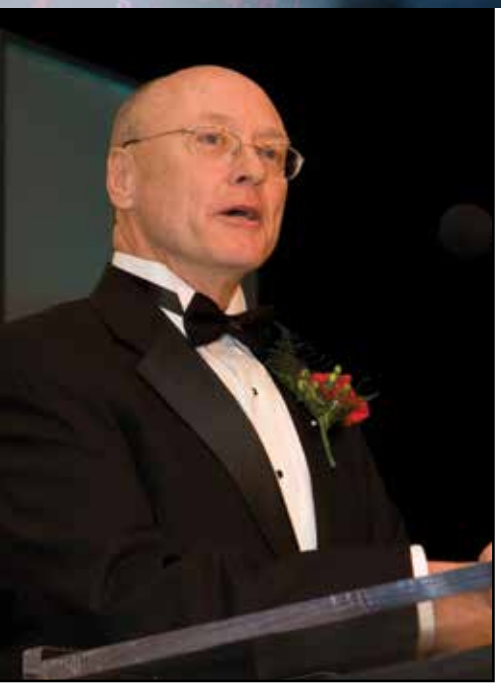
Process control: The question here is simple: What happens when you marry a demanding, quality-obsessed, just-in-time, penny-pinching industry like high-volume automotive manufacturing with a labor-intensive, black-artish industry like composites, where 5,000 units of anything is a lot, and 100,000 units might as well be infinity? Certified suppliers to the likes of Ford, GM, Chrysler, or VW play by a very demanding set of rules in terms of process control, quality control, on-time delivery, enterprise management, cost containment, documentation, accountability and a host of other factors. None of these, however, is more important than process control. Automotive parts suppliers cannot be in the business of checking every part before it goes out the door — that's just not practical. This means quality must be *built into the process:* Raw materials, machinery, procedures, and processes must be carefully developed and kept consistently within specification; if this is accomplished, parts resulting from such a well-managed system should be within specification. Composites manufacturers make quality parts, and they make them to spec, but the *de facto* process control model in this industry does not marry easily with automotive's. The challenge starts with my first point above regarding capital equipment. On top of that, some parts of the composites industry are still labor-intensive, which tends to increase scrap rates and eat away profits. The composites community can meet the challenge, but it must be acknowledged, as Andreas noted to me in 2011, that it is different.

Composites have much to offer the automotive industry, particularly as carmakers work to meet CAFE and emissions standards. And you can rest assured that suppliers to the industry, as well as manufacturers themselves, see the potential composites hold for cars — and the potential cars hold for composites. Development of resin, fiber, and processes to meet carmakers' high-speed needs is urgent and ongoing.

Joining the ranks of the global automotive supply chain, however, might be occasionally challenging for some composites manufacturers. But proper execution could generate rewards all around, for suppliers, carmakers, and consumers.

An Engineer's Life...

By Dave Reed



"If you aren't the lead dog, the scenery never changes."

Cars are fun because when you get done engineering a new one, you can drive it and own it if it's your favorite. I grew up in Dearborn, Michigan, in the shadow of the Ford Rouge Plant. I liked math and science in high school and was into amateur rocketry as a kid. I made my own rocket fuels and machined my own de Laval nozzles and nose cones too.

In 1963 I had an opportunity to go to what was then called the General Motors Institute (GM) and is now called Kettering University. I was sponsored as a co-op student by General Motors Corp.'s Chevrolet Engineering Center in Warren, Michigan. I was hooked by the howl of the *Corvette* racing engines from the dyno cells and met some real car guys. At Kettering I liked materials and chemistry best and got my degree in Mechanical Engineering with the Materials Science option. After graduation I joined the Chevrolet Materials Engineering Group. I got into plastics and elastomers right away because that's where all the development was happening. I liked doing things that hadn't been done before, and there were so many *opportunities* to improve all the cars and trucks of the 1960s – cleverly disguised as *problems*.

I developed nylon (polyamide) fuel lines for my thesis project because that was cutting edge at the time. I recommended the new Type 11 polyamide over the Type 66 that had been used previously. Subsequently, Type 11 polyamide became an industry standard for fuel lines and saved the auto companies millions of dollars over the years.

After graduation I was given responsibility for all plastics, composites, adhesives, gaskets and elastomers on all cars and trucks and engines. Talk about baptism by fire. It was a huge job even for the previous senior engineer who had left some big shoes for me to fill, but I loved it. Fortunately I'd been a co-op student in the Materials Group during my senior year and thesis year. And because I was so green, there were a lot of people on my side encouraging me. There were so many problems and challenges that it was like shooting fish in a barrel. If you took aim, you couldn't help but hit something and fix it.

Plastics provided all kinds of challenges and opportunities, but elastomers demanded immediate attention. Beneath the glitz and glamour of the '60s muscle cars and land yachts, most of the styrene-butadiene rubber (SBR), nitrile, neoprene and natural rubber parts needed replacement in 3 or 4 years from the time they left the showroom. First I helped change the heater and radiator hoses to ethylene propylene diene monomer (EPDM), tripling their use life. Later I worked with the design engineers to change the rubber hoses for fuel, air conditioning, power steering, transmission oil coolers, vacuum brake, evaporative emissions etc. to triple their lives too. Powertrain seals and gaskets needed similar improvements, and I worked with the design engineers to make those changes as well. We replaced nitriles and neoprenes with fluoroelastomers, chlorinated elastomers, acrylic elastomers, and room-temperature vulcanizing (RTV) silicones.

I always loved sports cars and GM made some of the best and I got to work on most of them: *Corvette, Camaro, Chevelle SS, Monza, Trans Am,* and *Fiero*. Sports cars are always more aggressive and their engineering teams are always more willing to try new technologies. They often found they needed plastics and composites to meet their performance goals. I was in heaven.

An Engineer's Life CONTINUED FROM PAGE 11

In 1968, *Chevrolet* management made a last-minute decision that we needed a hot new 1970 *Chevelle SS* to match the ground ripping *Pontiac GTO*. I was fresh out of Kettering and had just been made responsible for all *Chevrolet* plastics, elastomers, etc. so I got this new *SS* project with deadlines too tight to follow any rules. Some of the special parts included the huge black rear bumper pad, the articulated air-intake scoop and the cowl induction lettering on the hood. My bosses knew we'd have to think outside the box, and they let me develop several new materials solutions that fortunately worked great and saved a ton of money. I changed the rubber bumper pad and attaching bolts to more weatherable polyvinyl chloride (PVC) with heat-activated adhesive instead of bolts — the largest PVC injection-molded part that had ever been used in automotive. I changed the zinc die cast air-intake scoop to painted reinforced nylon, which may have been a first as well. I changed the zinc die cast COWL INDUCTION lettering and fasteners to plated acrylonitrile butadiene styrene (ABS) with a high-temp silicone adhesive that GM Research developed especially for me, as those big-block engines gave off too much heat for any existing pressure-sensitive adhesives to hold on. I was so young and aggressive, and it probably helped that I didn't know these things couldn't be done so quickly. Seems unbelievable now to start so many materials innovations a mere 14 months before start of production, but the materials suppliers and molders really helped us make it a big success for *Chevrolet*.

Later I worked with materials suppliers to develop polyurethane bumper fascias produced by reaction-injection molding (RIM) for the *Corvette, Monza, Camaro* and *Chevelle*. Then I went to *Pontiac* to help the 1979 *Firebird Trans Am, LeMans,* and *Grand Prix* with improved RIM urethane bumper fascias. I was responsible for all plastics and elastomers at Pontiac and the fun took a quantum leap when I helped concept and develop the all-composite body *Fiero* mid-engine sports car for 1984. Again, the material suppliers and molders came through with stiffer reinforced RIM urethane composites for the fenders, doors, and fascia, and smoother sheet-molding compounds (SMCs) for better appearance on the hood, roof, and rear deck – an industry-first composite-bodied car made with tough RIM urethane body panels. Instead of a conventional stamped and welded steel front trunk, I got the material suppliers and molders involved and we developed a one-piece molded glass mat thermoplastic (GMT) composite front trunk in fiberglass-reinforced polypropylene that may have been another industry first and saved us a ton of mass and money. We needed a one-piece rear-deck spoiler and the material suppliers and molders came through again with another first: a blow-molded polyamide/polyphenylene ether (PA/PPE) alloy body-color painted rear spoiler. For the new 1986 *Fiero GT* model, we switched the rear quarter window from glass to silicone hard-coated polycarbonate to save another ton of mass and money. Yet again, the materials suppliers and molders came through with another industry first.

My next job was to help the future 1994 *Camaro Firebird* team develop the new materials needed for composite body panels. The vehicle started almost entirely as a steel body, but when I came on board I helped the chief engineer and

the team see the features and capabilities of composites, and it became almost entirely a composite body. Again, our materials suppliers and molders met the challenge and came up with improved composites for the fenders, hood, roof bow, deck lid, spoiler, doors, and bumper fascias.

Then I got another exciting call from the new GM Vice President and Chief Engineer of the future *Saturn* vehicle, Jay Wetzel. The *Saturn* concept was an all-steel body and Jay asked me to help the team consider what composites could do. I helped

An Engineer's Life CONTINUED FROM PAGE 12

them see the advantages of injection-molded thermoplastic composite body panels for lower tooling costs, multiple models off the same steel platform, as well as corrosion and dent resistance, and the *Saturn* was changed from all-steel to composite fenders and doors as well as bumper fascias.

GM was just developing the highly innovative *EV 1* battery electric vehicle for the future 1995 model and it was going to be an aluminum structure with all composite body panels. I joined that program early, and the *Fiero* composite materials adapted readily to the *EV 1* body and production needs. We changed the door materials to an all-SMC inner and outer panel similar to that on the *Corvette* and *Camaro* for more mass savings. The vehicle was designed with a 1 m x 2 m structural aluminum die cast battery tray to support a half ton of lead-acid batteries. I proposed we change the die casting to GMT polypropylene composite to save mass and money and avoid corrosion issues. The materials and molders pitched right in and made it another success and another industry first.

My last 10 years with GM were devoted to helping improve the materials used in our interiors for softer feel and improved durability – starting with the *Cadillac CTS, STS, SRX, CTS Wagon,* and *CTS Coupe*, which were all well received by the media and customers for their improved interiors.

I'd like to thank the whole GM Engineering Team through the decades for making so many vehicles better with improved plastics, composites, and elastomers. I'd also like to thank all the materials suppliers and molders who made it all possible.

"Do what you love and you'll never work a day in your life."

ABOUT DAVE REED

David (Dave) B. Reed P.E. began his career at then General Motors Corp. (GM) in 1963 while a co-op student at then General Motors Institute (GMI, renamed Kettering University), from which he received his B.S. degree in Mechanical Engineering / Materials Science. He joined the Chevrolet Materials Group in 1967 and went on to work for the automaker for 45 years in Product Engineering and helped develop many innovative automotive plastics applications as well as had a leading role on many of GM's composite-bodied vehicles. Before retiring from GM in 2008, Reed proposed GM's partnership role in starting an industry-wide plastics recycling program with government assistance, which eventually became the United States Council for Automotive Research LLC (USCAR) Vehicle Recycling Partnership. He also led GM's recycling team to share and optimize use of in-house plastics molding scrap across all GM's molding operations, saving the automaker millions of dollars annually. Reed has a long history of service to engineering societies. He is a recipient of SAE International's Forest R. McFarland Award for work on innovative technical sessions on such topics as Advances in Automotive Composite Body Panels, New Composite Cars, New Developments in Asian Plastics Applications, and Automotive Plastics Recycling. He also organized and led a technical session on Challenges in SMC Finishing at SPE's own inaugural Automotive Composites Conference & Exhibition (ACCE), and has been a long-time director on the board of the SPE Automotive Div. In 2011, he was named the SPE Automotive Div *Lifetime Achievement Award* winner.

ANTEC® 2014

2014 SPE ANTEC's Automotive Program

Anthony Gasbarro, ANTEC 2014 Committee Chair

SPE's Annual Technical Conference (ANTEC) 2014 will be held in Las Vegas, Nevada from April 28-30 at the Rio All Suites Hotel and Casino.

While we are still in the early stages of organizing for the event, we are aggressively seeking people who are willing to present some new technology that they are working on in the field of Automotive Plastics. We have been growing our Automotive Session over the past few years, and I really hope to continue that trend. In 2013, we had 8 papers presented, and we hope to have more than 12 for 2014. Can you help make that happen?

Your offering can be a formal presentation based on an actual research paper – or it also can be a slightly commercial presentation that highlights some new advances in your field. We are open to various sorts of presentations and are willing to work with people to fit their needs as well as our own.

There also are a few positions open for keynote presentations. These keynotes give the presenter up to 1 hour to talk about a topic. Last year, long-time plastics author, Don Rosato and myself joined together for a keynote on recent advances in the ways plastics are helping to make automobiles lighter. Our collaboration worked well and I believe it played to each speaker's strong points.

ANTEC is a wonderful way to see the work that others are doing in all sorts of areas of plastics, and we would really appreciate if you could take the time to show the work you are doing. Typically, over 900 presentations are given at ANTEC each year, and each one is important because it advances our industry. I personally feel that the work we do in automotive is worthy of showing to the rest of the plastics world. Whether it be advances in material technology, fasteners, processing, painting, strengthening, or *lightweighting*, we want to hear about it.

Please contact me if you are interested in presenting at ANTEC 2014 or if you have any questions about ANTEC in general. I would be happy to answer any questions you have.

Thank You.

Anthony Gasbarro

+1.248.721.0276
gasbarro-a@marubeni-usa.com

In Memoriam:
Josh Madden, Automotive Plastics Pioneer

In Memoriam

The SPE® Automotive Division is sad to report that on June 28, 2013, our friend, long-time board member, 2007 SPE Automotive Division Lifetime Achievement Award winner, and SPE *Director Emeritus*, Joshua (Josh) Madden passed from this life. Josh was not only a great human being, but he truly was one of the fathers of automotive plastics. For those who didn't know Josh, here is some of his background from the 2007 announcement about his Lifetime Achievement Award.

For a man whose list of automotive plastics innovations is legendary, ironically Madden began his career as a metallurgist. He started with General Motors Corp. (GM) in 1954 at the Pontiac Motor Division working in Product Engineering. He moved from the position of senior experimental metallurgist, to become a rubber & plastics engineer, and then to the position of staff materials engineer. After 23 years at GM, Madden was recruited to join Volkswagen (VW) of America, in the role of executive engineer. There, he was responsible for setting materials engineering specifications, overseeing product translations, running production engineering, and liaising with VW headquarters in Germany. His responsibilities were expanded when he became chief engineer – Product Engineering. In 1984, VW made a decision to close its U.S. manufacturing operations in order to pursue the goal of becoming Europe's largest automaker. Despite the closure, Madden was retained as an active engineering consultant to VW's vice-president of Engineering, and also acted as VW's technical representative in Detroit.

In recent years, Madden had put his expertise to use as a materials and processing consultant to industry. He has also appeared as a guest lecturer at Wayne State University, Akron University, University of Wisconsin, Yale University, Purdue University, Lawrence Technological University, Oakland University, and the College for Creative Studies. Throughout his career, Madden was a member of, and often held leadership positions in, a broad range of technical committees, engineering societies, and professional organizations at GM, VW, SPE, the Society of Automotive Engineers (SAE), the American Society of Materials (ASM), the Detroit Rubber Group, Engineering Society of Detroit (ESD), Verein Deutscher Ingenieure (VDI, the German Society of Engineers), and the American Iron & Steel Institute (AISI). He also presented papers at numerous technical conferences and was invited to a government-sponsored event in South Africa on automotive components.

Madden received a national award presented by the Society of the Plastics Industry (SPI) for his work on the 1976 model year (MY) *Pontiac*® all-plastic *Phoenix*® *Project* car. He also accepted the Hall of Fame Award at the 2006 SPE Automotive Innovation Awards Gala for an application he personally developed: the thermoplastic front grille on the 1966 MY GM *Pontiac Bonneville*®, *Catalina*®, and *Tempest*® cars. This was the first thermoplastic part used on a passenger-vehicle exterior and its conversion from steel saved a whopping 6.4-8.2 kg (14-18 lb) depending on model.

Josh Madden CONTINUED FROM PAGE 16

Other innovations that Madden was personally involved with during his career include the first:

- Acetal IP cluster (replacing die-cast zinc) on the 1963 MY *Pontiac Tempest*;
- EPDM radiator hoses on all models of 1965 *Pontiacs*;
- Use of ABS parts on 1965 MY *Pontiacs*;
- Glass-reinforced HDPE structural front fender liner for the 1965 MY *Pontiac Bonneville*;
- Painted SMC timing-belt cover on the 1966 MY P*ontiac Tempest*;
- HDPE fuel tanks on passenger cars in the 1968 MY *Bonneville* station wagon;
- Cast PUR painted bumper on the 1968 MY *Pontiac GTO*®;
- BMC hood scoops on the 1968 MY *Pontiac GTO*;
- PC headlamp mounting panels on the 1969 MY *Pontiac Firebird*®;
- SMC rear spoiler on the 1969 MY *Pontiac Trans Am*®;
- SMC headlamp mounting panels on the 1969 MY *Pontiac Grand Prix*®;
- SMC engine mounted air-intake hood scoop on the 1970 MY *Pontiac Trans Am*;
- ABS painted wheel-opening spoilers on the 1970 MY *Pontiac Trans Am*;
- Injection-molded painted TPU front end panel on the 1973 MY *Pontiac Grand Am*®;
- SMC front end panel (a precursor to GOR panels) on the 1973 MY *Pontiac Grand Prix*;
- Automotive use of GMT composites as dunnage/hangers to hold parts as they moved through the paint line (1973);
- GMT grille-opening reinforcement panels for the 1974 MY *Pontiac Tempest*;
- Fiberglass-reinforced PUR rigid cast foam painted rear spoiler on the 1975 MY *Pontiac GTO Judge*;
- Lightweight composites demonstration car, the 1975 MY *LeMans*® (*Phoenix Project*), which allowed GM to drop 2 C.A.F.E. levels by reducing vehicle curb weight from 2,650 to 1,950 lb, and whose technology was later used for the *Pontiac Fiero*®; and
- Use of GMT composite for the parcel shelf of the 1978 MY *VW Rabbit*.

Originally from Drifton, Pa., Madden attended the Mining & Mechanical Institute as well as Muhlenberg College. He took graduate-level courses at Wayne State University, University of Michigan, General Motors Institute (now Kettering University), and Mercy College. He achieved the rank of 1st lieutenant in the Army. He was a Kiwanis member for 25 years. And he was Operations chair at the Meadow Brook Concours d' Elegance in Detroit for 23 years. His hobbies were photography and fly fishing. He also was a member of the vestry at All Saints Episcopal Church in Pontiac, Michigan.

OCT 6-9, 2013

TPOs: Driving Value, Light Weight, & Innovative Automotive Solutions

15TH-ANNUAL

TPO AUTOMOTIVE ENGINEERED POLYOLEFINS CONFERENCE®

DETROIT

ATTEND SHOW

EXHIBIT & SPONSORSHIP OPPORTUNITIES

2013 SPONSORS

Advanced Composites, ExxonMobil Chemical, sabic, Trinity Resources, Albis, Borealis, Braskem, Cimbar, Dow, Imerys Talc, Inteva, lyondellbasell, Milliken, Mitsui Plastics Inc., multibase, Mytex Polymers, nyco, PolyOne, Sumitomo Chemical, Styron, Adchem, A. Schulman Inc., Addcomp Polymer Additive Solutions, addivant, Adell, americhem, Asahi Kasei Plastics North America, Inc., BASF, BYK Additives & Instruments, elastron, Evonik, Flint Hills resources, IAC, IMIFABA, Jowat, JSR Corporation, Lotte Chemical Alabama, Monark, Netzsch, Noble polymers, RA, RheTech, Analysis Management Decisions, Songwon, SMS Surface Machine Systems, Techmer PM, United Paint, Vista Color, Weyerhaeuser, Automotive NewsWire, Automotive Design and Production, AutoFieldBlog, CPRJ, CPRJ International, Revista industrias plásticas, Modern Plastics India, Revista Noticiero del Plástico, Plastics Engineering, Plastec Global, Plastics, The Molding Blog, Prototype Today, Revista Reciclado y Plásticos, TPE magazine, WardsAuto.com

ATTEND THE WORLD'S LEADING AUTOMOTIVE ENGINEERED POLYOLEFINS FORUM

Now in its 15th year, the show is the world's leading automotive engineered polyolefins forum featuring 60+ technical presentations, keynote speakers, networking receptions, & exhibits that highlight advances in polyolefin materials, processes, and applications technologies as well as a growing range of thermoplastic elastomers (TPEs) and thermoplastic vulcanizates (TPVs). This year's show will be held Oct. 6-9, 2013 at the Troy-Marriott (Troy, Michigan) in the suburbs of Detroit.

PRESENT TO THE LARGEST GROUP OF DECISION MAKERS IN AUTOMOTIVE ENGINEERED POLYOLEFINS

The SPE TPO ***Automotive Engineered Polyolefins Conference*** typically draws over 500 attendees from 20 countries on 4 continents who are vitally interested in learning about the latest in rigid and elastomeric TPO as well as TPE and TPV technologies. Fully a third of conference attendees work for a transportation OEM, and roughly 20% work for a tier integrator. Few conferences of any size can provide this type of networking opportunity and offer such an engaged, global audience vitally interested in hearing the latest olefin advances.

SHOWCASE YOUR PRODUCTS & SERVICES AT THE WORLD'S LARGEST AUTOMOTIVE ENGINEERED POLYOLEFINS FORUM

Many sponsorship packages are available. Companies interested in showcasing their products and/or services at the SPE Auto TPO should contact TPOsponsor@auto-tpo.com.

FOR MORE INFORMATION

www.auto-tpo.com or www.speautomotive.com/tpo

Ph: +1.248.244.8993, ext. 3 or email: Karen@auto-tpo.com

SPE Detroit Section, 1800 Crooks Road, Suite A, Troy, MI 48084, USA

Best Papers

2013 SPE® ACCE *Best Paper Award* Winners to be Honored During Opening Ceremonies

This Year's three ***Best Paper Award*** winners for the 13th-annual ***SPE® Automotive Composites Conference & Exhibition*** (ACCE) all will be presented in the Virtual Prototyping & Testing of Composites session. These three author teams received the highest average ratings by conference peer reviewers out of a field of 90 contenders and will be honored during opening ceremonies. Honorees Thierry Malo, engineering services team leader at ***e-Xstream engineering***, an MSC Company; David Sheridan, senior design engineer at ***Ticona Engineering Polymers***, the engineering polymers business of Celanese Corporation; and Dr. Ivor Huan-Chang Tseng, program manager at ***CoreTech System (Moldex3D) Co. Ltd.*** or their representatives will receive a commemorative plaque for excellence in technical writing during opening ceremonies at this year's SPE ACCE.

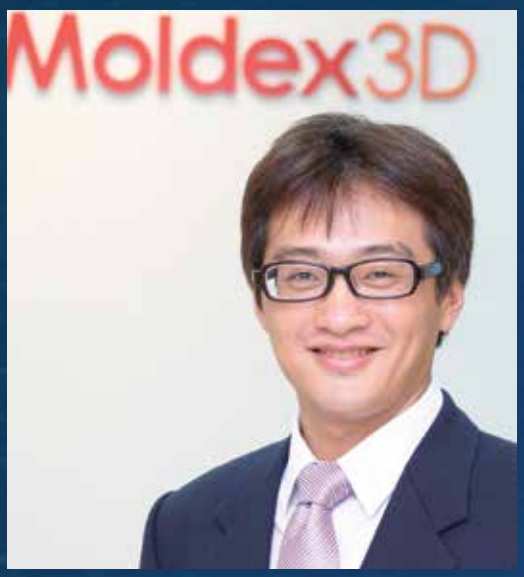
Thierry Malo, engineering services team leader at ***e-Xstream engineering*** was lead author (along with Laurent Adam and Roger Assaker, also of e-Xstream engineering, and Tsukatada Matsumoto and Riccardo Giacomini from Toyota Motor Europe) on a paper entitled ***Multi-Scale Modeling of High Cycle Fatigue of Chopped and Continuous Fiber Composites***, which will be presented by e-Xstream colleague, Kurt Danielson on September 12 from 8:00-8:30 a.m. The paper introduces two micro-mechanically based composite fatigue models. The focus is on the high-cycle fatigue model implemented specifically for chopped-fiber-reinforced plastics that were used on an automotive oil-cooler bracket on a Toyota vehicle in Europe. The bracket is molded from short-glass-reinforced polyamide (PA, also called nylon) 6/6 resin. Through this case study, the presentation shows how the use of proper fatigue-modeling tools, developed specifically for composites, can increase the accuracy of simulation in the field of durability and pave the way for new simulation standards that help support the desired weight reductions of vehicle components.

Aside from Malo's current responsibilities as team leader for the engineering services group at e-Xstream, he also is involved in all initiatives at the company on fatigue modeling of composites. He joined e-Xstream in 2009 as a project engineer. Before that, he worked for Rhodia Engineering Plastics on the development of state-of-the-art composite modeling techniques.

Best Papers

David Sheridan, senior design engineer at ***Ticona Engineering Polymers*** was lead author (along with Ulrich Mohr-Matuschek and Anton Grzeschik of Ticona GmbH, and Roland Peter of Inteva Roof Systems) on a paper entitled ***Integrated Anisotropic Simulation for Components Made from Glass Fiber Reinforced Thermoplastics***, which he will present on September 12 from 11:30 a.m. - 12:00 p.m. along with a tutorial earlier that day on Design & Development of Precision Plastic Gear Transmissions. The paper discusses how accurately analyzing and predicting the mechanical behavior of components made from fiber-reinforced thermoplastics is complex owing to the fact that fibers are individually oriented during injection molding. Finite-element analysis often uses isotropic material models, but accuracy of results can be improved if local fiber orientations are considered with anisotropic material properties. The paper introduces the analysis process and a practical application.

Sheridan has worked for Ticona and been involved with the design and analysis of plastic parts for over 25 years. He also has been involved with plastic gear design and analysis for the past 15 years and is an active member of the American Gear Manufacturers Association's Plastics Gearing Committee. He has authored many articles on plastic part and gear-related topics. He holds a Bachelor's of Science degree in Mechanical Engineering from the former GMI Engineering & Management Institute (now called Kettering University).



Dr. Ivor Huan-Chang Tseng, program manager at ***CoreTech System (Moldex3D) Co. Ltd.***, was lead author (along with Yuan-Jung Chang, Tzu-Chang Wang, and Chia-Hsiang Hsu of CoreTech System (Moldex3D) Co., Ltd., and Rong-Yeu Chang, National Tsing-Hua University) on a paper entitled ***Three Dimensional Predictions of Fiber Orientation for Injection Molding of Long Fiber Reinforced Thermoplastics***, which will be presented on September 11 from 2:30 - 3:00 p.m. by Moldex3D colleague, Ken (KC) Cheng. The award-winning paper discusses a recently proposed new fiber orientation model for improving the previously developed models for long fiber-reinforced thermoplastic (FRT) composites with regard to interaction and diffusion of the fibers immersed in a matrix. This Improved Anisotropic Rotary Diffusion model combined with Retarding Principal Rate (iARD-RPR) model has been demonstrated to describe changes in fiber orientations well, whether treating short fibers or long fibers. This was demonstrated in a study using 40 wt% glass-fiber immersed in a polypropylene matrix that was injection molded in a center gated disk. Good correlation was achieved between predicted fiber orientation distribution through the thickness and experimental results.

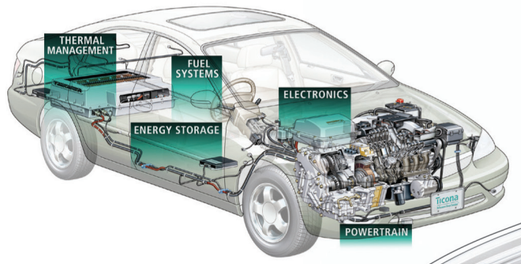
Tseng received his Ph.D. degree in Applied Chemistry from National Chiao-Tung University (NCTU) in Taiwan in 2008. Under the direction of professors Rong-Yeu Chang and Jiann-Shing Wu, Tseng's major research interests focused on molecular simulations, involving molecular dynamics (MD), Monte Carlo (MC), and dissipative particle dynamics (DPD) methods, with applications to predictions of nano-thermodynamic and nano-rheological properties of polymer materials. Many of his non-equilibrium molecular dynamics simulation (NEMD) studies for sheared n-hexadecane fluid have been published in the *Journal of Chemical Physics*. In his current job as program manager in the R&D Division of CoreTech, Tseng's main research areas are composite and polymer processing, polymer rheology and viscoelasticity, and molecular simulations, and he is responsible for theoretical development with a focus on the prediction of fiber orientation during processing of fiber-reinforced composites. Recently, he has expanded his research into new areas including powder concentration and particle migration for metal injection molding (MIM).

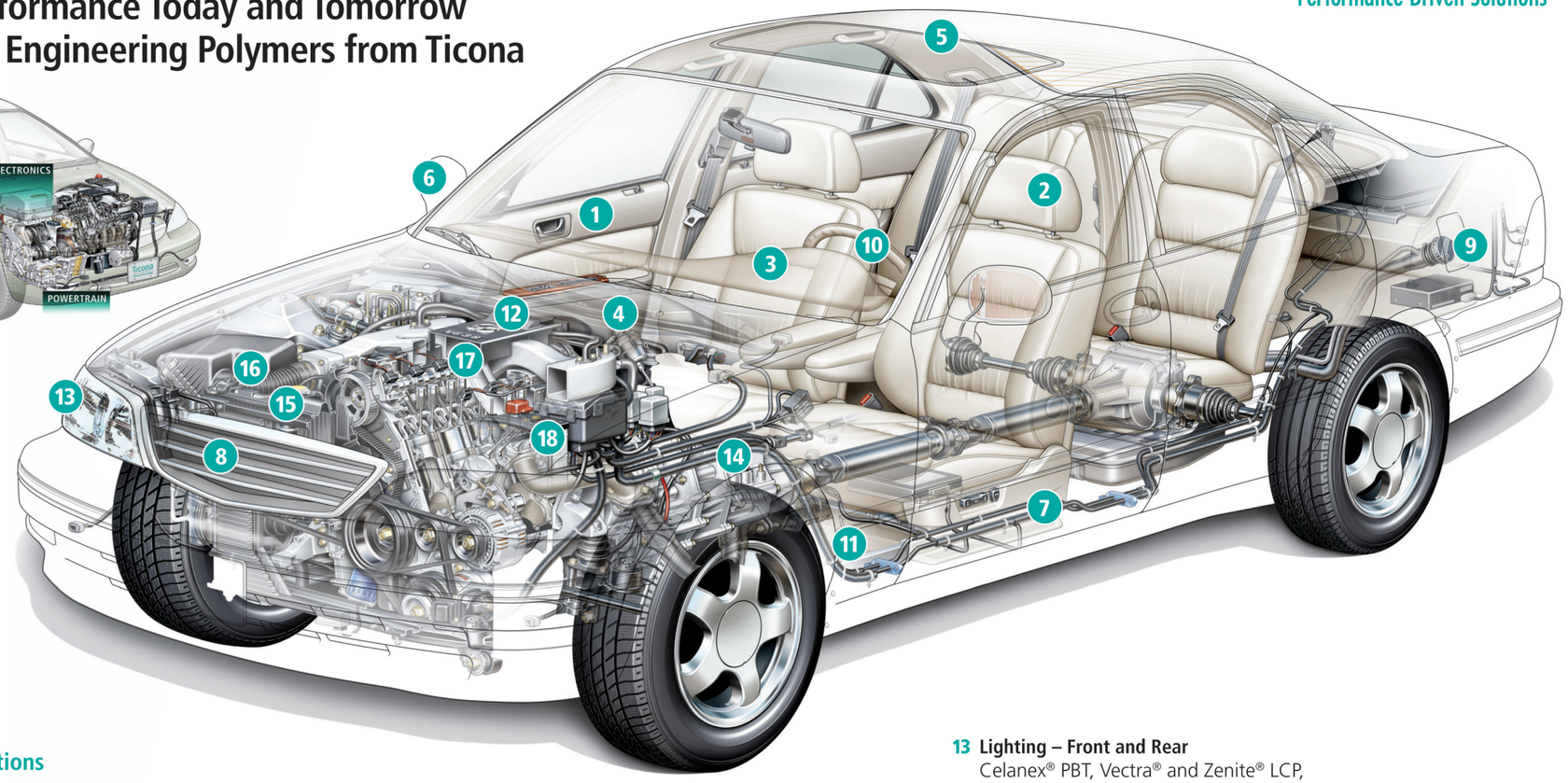
Please join us in congratulating all three authors (or their representatives) for their hard work and dedication to excellence in technical writing, and be sure to catch their presentations during this year's show.

Performance in Motion™

Power Your Performance Today and Tomorrow With Advanced Engineering Polymers from Ticona

Ticona
Performance Driven Solutions™





Integrated System Solutions

1 Door Modules
Celanex® PBT, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT, Celstran® CFR-TP

2 Seating and Restraint
Celanex® PBT, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT, Celstran® CFR-TP, Riteflex® TPC-ET, Vandar® PBT

3 Instrument Panel
Celstran,® Compel® and Factor® LFRT

4 Wiper/Washer
Celanex® PBT, Hostaform® and Celcon® POM

5 Sunroof
Celanex® PBT, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT

6 Mirror
Celanex® PBT, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT

7 Fasteners and Supports
Hostaform® and Celcon® POM

8 Front and Rear End Modules
Celanex® PBT, Impet® PET, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT

9 Fuel System
Celanex® PBT, Hostaform® and Celcon® POM, Fortron® PPS, Riteflex® TPC-ET

10 Cockpit
Celanex® PBT, Hostaform® and Celcon® POM, Celstran,® Compel® and Factor® LFRT, Riteflex® TPC-ET, Vandar® PBT

11 Chassis
Celstran,® Compel® and Factor® LFRT, Celstran® CFR-TP

12 Cross Car Beam
Celstran® CFR-TP

13 Lighting – Front and Rear
Celanex® PBT, Vectra® and Zenite® LCP, Fortron® PPS, Thermx® PCT

14 Powertrain – Transmission
Celanex® PBT, Celstran,® Compel® and Factor® LFRT, Fortron® PPS, Vectra® and Zenite® LCP, Thermx® PCT

15 Powertrain – Water Management
Celanex® PBT, Celstran,® Compel® and Factor® LFRT, Fortron® PPS, Vectra® and Zenite® LCP, Thermx® PCT

16 Powertrain – Air Management
Celanex® PBT, Celstran,® Compel® and Factor® LFRT, Fortron® PPS, Vectra® and Zenite® LCP, Thermx® PCT

17 Powertrain – Engine
Celanex® PBT, Celstran,® Compel® and Factor® LFRT, Fortron® PPS, Vectra® and Zenite® LCP, Thermx® PCT, Riteflex® TPC-ET

18 Electronics
Celanex® PBT, Impet® PET, Vectra® and Zenite® LCP, Fortron® PPS, Thermx® PCT, Hostaform® and Celcon® POM

World-Class Engineering Polymers

Celanex® Thermoplastic Polyester
- Outstanding thermal and chemical resistance
- Toughness
- Rigidity
- Exceptional dimensional stability
- Superior electrical properties

Hostaform®/Celcon® Acetal Copolymer
- Excellent mechanical properties
- Inherent lubricity
- Chemical and fuel resistance
- Broad temperature use range
- Aesthetics including low gloss and colors

Celstran,® Compel® and Factor® Long Fiber Reinforced Thermoplastics
- High stiffness
- Exceptional toughness
- Superior strength-to-weight ratio
- Long-term dimensional stability
- Wide temperature use range
- Scalable electrical properties

Celstran® Continuous Fiber Reinforced Thermoplastics
- Low weight with high strength and stiffness
- Superior dimensional and thermal properties
- Wide range of resins and fiber reinforcement technologies

Fortron® Polyphenylene Sulfide
- High continuous use temperature
- Resistance to auto fuels and fluids
- Inherent flame resistance
- High strength and dimensional stability

GUR® Ultra-High Molecular Weight Polyethylene
- Abrasion resistance
- Impact strength
- Chemical resistance
- Self-lubricating properties/low coefficient of friction

Impet® Thermoplastic Polyester
- Outstanding physical properties
- Superior thermal and chemical resistance
- Toughness
- Rigidity
- Dimensional stability
- Wide temperature use range

Riteflex® Thermoplastic Polyester Elastomer
- Excellent toughness and fatigue resistance
- Outstanding chemical resistance
- Good low temperature impact
- Wide temperature use range

Thermx® Polycyclohexylene-Dimethylene Terephthalate
- High temperature resistance
- High electrical properties
- Chemical and fuel resistance
- Dimensional stability

Vandar® Thermoplastic Alloy
- Excellent chemical resistance, ductility and stiffness
- High impact strength at low temperatures

Vectra®/Zenite® Liquid Crystal Polymer
- Superior thermal characteristics and dimensional stability
- High strength and modulus
- Broad chemical resistance
- Low mold shrinkage
- Excellent electrical properties
- Inherent flame resistance

Celanese
Ticona – A Business of Celanese
Ticona Engineering Polymers, 8040 Dixie Highway, Florence, KY, USA 41042

www.ticona.com

6th–Annual SPE® ACCE

Student Poster Competition

The SPE® ACCE is once again hosting a student poster competition, which showcases emerging composites technologies for automotive and ground-transportation applications. This year's contest is the largest in the conference's history with 30 graduate students (nearly double last year's 16) representing 18 universities in the U.S., Canada, and the Republic of Korea (nearly double the 10 schools participating in last year's competition). Students of winning posters judged to be in the Top 3 of the show will receive plaques at a formal recognition ceremony during lunch on the second day of the conference, and all students will receive monetary prizes to help defray travel expenses, courtesy of competition sponsor, INVISTA Engineering Polymers.

Explaining why the company decided to support this year's competition, Kurt Burmeister, executive vice-president, INVISTA Engineering Polymers said, "Inspiring future leaders to innovate with passion and find fulfillment in everything they do are core principles at INVISTA. As the auto industry continues to seek innovative solutions to solve today's challenges, we look forward to seeing the students' great ideas and creativity throughout this competition."

Judges made up of media, industry experts, and SPE board members will review all posters with student authors on the first day of the conference. Any attendee of this year's conference may participate in the judging (please inquire at the front desk for more information on how to become a judge). Students and their posters will be ranked according to 9 criteria:

- Content (student and poster demonstrate clarity of topic, objectives, and background);
- Motivation for research and technical relevance to conference theme;
- Methodology and approach to problem;
- Quality of proposed research results/findings;
- Conclusion are supported by information presented;
- Presentation (display aesthetics are pleasing and there is a logical flow between sections);
- Knowledgeable (presenter has a good grasp of the subject);
- Understandability (poster is effective even without student being present to explain it); and
- Overall rank vs. other posters and presenters.

Since 2008, the SPE ACCE poster competition has been organized annually by Dr. Uday Vaidya, SPE Composites Division board member and education chair, and professor and director-Engineered Plastics & Composites Group, Department of Materials Science & Engineering at University of Alabama at Birmingham (UAB). This year he is joined by Dr. Leonardo Simon, professor, Chemical Engineering Department, University of Waterloo and also a co-organizer for both the Nanocomposites and Bio & Natural Fiber Composites sessions at this year's conference; and Dr. David Jack, professor, School of Engineering & Computer Science, Baylor University.

Topics, student authors, and schools accepted into this year's competition include:

1. Andrew Anstey, Sudhakar Muniyasamy, Murali Reddy, Manju Misra, & Amar Mohanty, **University of Guelph:** *Processability and Biodegradability Evaluation of Poly(butylene succinate) (PBS) Green Composites with Biofuel Co-Products for Automotive Interior Application*

2. Birat KC, Mohini Sain, & Jimi Tjong, **University of Toronto:** *Rapid Prototype Development of Bio-Composite Engine Beauty Cover*

3. Mark J. Cieslinski, Kevin J. Meyer, John T. Hofmann, & Donald G. Baird, **Virginia Tech:** *Determining Orientation Model Parameters Independent of Processing Flows for Long, Semi-Flexible Fiber Composites*

4. Md. Mahmudur Rahman Chowdhury, Mohammad Washim, & Mohammad Kamal Hossain, **Tuskegee University:** *Interfacial Improvement of Nanophased Jute Fiber Reinforced Green Composites by Surface Modification*

5. M. Doody, J. Johrendt, & B. Minaker, **University of Windsor:** *Design and Development of a Composite Automotive Anti-Roll Bar*

6. Eugene Enriquez, Singaravelu Vivekanandhan, Amar K. Mohanty, & Manjusri Misra, **University of Guelph:** *Producing a Novel Green Polymer Blend from Poly(trimethylene terephthalate) (PTT) and Biobased Polyethylene (BioPE) for the Creation of Lightweight Composite Materials for Automotive Applications*

7. Stephanie Fierens, Mahmood Haq, Leonardo da Costa Sousa, & Venkatesh Balan, **Michigan State University:** *Green Composites from Cotton-Gin Waste for Structural Applications*

8. Brian M. Greenhoe, Mitchell Woellner, & Jeffrey S. Wiggins, **University of Southern Mississippi:** *Dispersion and Stabilization of MWCNTs in an Epoxy Thermoset Prepolymers using Continuous Reactors*

9. Md. Ekramul Islam, Mahesh Hosur, Muhammad M. Rahman, & Alfred Tcherbi-Narteh, **Tuskegee University:** *Elevated Temperature Performance of Epoxy Composites Modified with Reactive Polyol Diluent and Multi-Walled Carbon Nanotubes*

10. Ninad Joshi & Steven Donaldson, **University of Dayton:** *Optimization of the Amount and Position of Unidirectional Carbon Fiber in a Glass Fiber / Carbon Fiber Hybrid Box Beam to Achieve Desired Bending Stiffness*

11. ByeongJoo Kim, Biplab Kr Deka, Gu-Hyeok Kang, Hye Gyu Kim, Hyung Wook Park, Young-Bin Park, Aeri Oh, & HeeJune Kim, **Ulsan National Institute of Science and Technology (UNIST):** *Processing and Characterization of Continuous Carbon Fiber-Thermoplastic Composites Reinforced with Carbon Nanotubes and Exfoliated Graphite Nanoplatelets*

12. Alper Kiziltas, Yousoo Han, & Douglas J. Gardner, **University of Maine:** *Carrier Systems for Cellulose Nanofibrils in Hydrophobic Polymer Composites for the Automotive Applications*

13. Esra Erbas Kiziltas, Alper Kiziltas, & Douglas J. Gardner, **University of Maine:** *Optical Applications of Cellulose Nanocomposites for the Automotive Industry*

14. Ben Lewis, Carlton Metcalf-Doetsch, & David Jack, **Baylor University:** *Consideration of the Macro Processed Part Performance of Short-Fiber Thermoplastic Composites Due to Selection of Fiber Interaction Model*

15. John Michael Lindahl & Gregorio Vélez-Garcia, **University of Tennessee & Oak Ridge National Laboratory:** *Fused Deposition Modeling using Modified Thermoplastics*

16. Sam Lukubira, Ozgun Ozdemir, & Amod A. Ogale, **Clemson University:** *Melt Spinning of Soy Flour Filled Polyethylene Fibers*

17. Tanjheel Mahdi, Md. Ekramul Islam, & Mahesh Hosur, **Tuskegee University:** *Evaluation of Impact Response of Carbon Fiber Reinforced Epoxy Composites Modified with Hybrid Nanoparticles*

18. Spandan Mishra, Arda Vanli, & Chiwoo Park, **FA&M University – Florida State University (FAMU-FSU):** *Constrained Principle Components Analysis Method for Damage Quantification with Lamb Wave Sensors*

19. Marlon Morales & Amod A. Ogale, **Clemson University:** *Rapid UV-Assisted Stabilization of Polyacrylonitrile-Based Carbon Precursors for Carbon Fiber Production*

20. Makoto Schreiber , Singaravelu Vivekanandhan, Peter Cooke, Amar K. Mohanty, & Manjusri Misra, **University of Guelph & New Mexico State University:** *Green Sub-Micron Diameter Carbon Fibres from Lignin for Automotive Applications: A Novel Study on Precursor Materials, Treatments, and Carbonization*

21. Timothy Polom, Prabhu Rajagopal, Mahmoodul Haq, Krishnan Balasubramanian, & Lalita Udpa, **Michigan State University:** *The Feasibility of Rayleigh Guided Wave Utilization for Remote Inspection*

22. Jacob Ripberger, Anton Khomenko, Mahmood Haq, Nick Gianaris, & Gary Cloud, **Michigan State University:** *A Tailorable Fastening System for Dissimilar Material Joining*

23. Matthew Smyth, Vida Poursorkhabi, Amar K. Mohanty, Stefano Gregori, & Manjusri Misra, **University of Guelph:** *Piezoelectric Poly(lactic acid) (PLA) Bioplastic Hybrid Microfibre as a Novel Source for Sustainable Green Energy for Potential Automotive Application*

24. Michael Snowdon, Amar Mohanty, & Manjusri Misra, **University of Guelph:** *Melt Processing and Characterization of Nano-Bio-Composites made from Poly(butylene succinate) Bioplastic and Nano Carbon Black for Transportation Application*

25. Sarah Stair & David Jack, **Baylor University:** *Non-Destructive Testing of Carbon Fiber Laminates – Experimental Validation of Manufacturing Induced Curvature Predictions*

26. Byron Villacorta & Amod A. Ogale, **Clemson University:** *Carbon Nanoparticle-Based Polyethylene Nanocomposites for Enhanced Electromagnetic Shielding*

27. Alexis Wagner, Vida Poursorkhabi, Amar K. Mohanty, & Manjusri Misra, **University of Guelph:** *Novel Porous Electrospun Fibers from Blends of Poly(L-lactic acid)/poly(3-hydroxybutyrate-co-3-hydroxyvalerate) for Advanced Air Filters in Automotives*

28. Benjamin Willis, Matthew Record, & Michael Scott Carpenter, **University of Alabama at Birmingham & Bates College:** *Metal-Composite Hybrids for Automotive Applications*

29. Aaron Wright & Gregorio Vélez-Garcia, **University of Tennessee and Oak Ridge National Laboratory:** *Testing for Fused Deposition Modeling*

30. Meng Zhang & Amod A. Ogale, **Clemson University:** *Carbon Fibers Derived from Sustainable Precursors*

Please join us in welcoming the students and taking a good look at their hard work, which will be on display throughout the conference in the Crystal/Onyx Ballroom. This provides the students with an excellent opportunity to meet and talk with members of the automotive composites community and learn what it is like to work as an engineer or scientist in this field. It also provides OEMs and their suppliers with the opportunity to meet the next generation of automotive composites engineers and scientists and potentially to hire them.

The Effects of Injection Molding Process Parameters on Final Fiber Length of a Short-Fiber Composite

Tom Loken, Tim Osswald, *University of Wisconsin - Madison*
Paul Gramann, *The Madison Group*
Saeed Ziaee, *Winona State University*

ABSTRACT

Short fibers are commonly added to thermoplastic polymers to enhance their properties, e.g. tensile strength and stiffness. During processing, such as extrusion or injection molding, the length of the fibers is reduced from exposure to the high forces involved in melt formation and flow in the polymer melt. It is well-known that the efficacy of the enhancement depends upon final fiber length and length distribution. Therefore, it is critical to understand which processing parameters have the largest impact on fiber damage.

A design of experiments (DOE) was used to establish an experimental approach for study of four processing factors – injection rate, screw speed, mold temperature, and barrel temperature. Samples of commodity grade, glass-filled polypropylene were injection molded into ASTM tensile bars at various treatment combinations. The specimens were then tested in tension. Tensile strength and modulus were selected as response variables. Analysis of the experiment revealed injection speed and barrel temperature as significant factors. Tensile strength and modulus were larger for samples molded at low injection speed and/or high barrel temperature. Manual fiber length measurements of the coupons with the lowest and highest tensile strength revealed marked differences in average fiber length and fiber length distribution. The fiber length of the pellets (approximately 0.125 in.) was also characterized and compared to the processed material.

BACKGROUND

Short-fiber thermoplastic composites are widely used due to ease of processing, net shape capabilities and part consolidation, and significant cost savings. However, these composites have weaker properties than continuously reinforced types due to stress concentrations at the fiber ends and, with aspect ratios typically less than 100, an inability to utilize the full strength of the fiber [2]. Also, short-fiber composite materials develop a significant portion of their final properties during manufacturing wherein the matrix containing the fibers must flow in order to fill the part cavity. This flow causes fiber rotation and the development of orientation distributions.

Thomas Loken holds a B.S. degree in Composite Materials Engineering from Winona State University, Winona, Minnesota and an M.S. degree in Mechanical Engineering from the University of Wisconsin-Madison. He has worked in the plastics industry for over 5 years and has held positions as a processing, product, and manufacturing engineer, senior project engineer at The Madison Group, and senior test engineer and team leader for a medical device manufacturing company. Loken was a 2011-2012 ***SPE Automotive Composites Conference & Exhibition*** (ACCE) graduate-level scholarship award winner.

 CONTINUED FROM PAGE 26

Injection molding is one of the most widely used processes for thermoplastic resins. Injection molding is known to cause significant fiber damage within the reinforced resin, the extent of which is dependent upon the processing parameters. Thermoplastic composites with severely degraded properties can significantly underperform predictions, resulting in unexpected catastrophic failure during the service life of the component. Therefore, it is critical to understand which processing factors most significantly impact fiber damage or fiber length attrition.

In literature, fiber damage has been attributed to the following mechanisms:

- Fiber breakage during polymer melting where the fiber is partially embedded in a solid bed and partially exposed to molten polymer flow [3, 4, 5]. If the flow causes high enough shear stress in the fiber, it will break off at the interface.
- Fiber buckling from excessive compressive stresses induced by shear flow during fiber rotation while traveling in polymer melt [3, 4, 5].
- Fiber-fiber interaction (collisions and friction) causing abrasions and stress concentrations resulting in length reduction.
- Overlap of fibers or spatial hindrance, causing bending moments and fiber breakage [6, 7, 8, 12].
- Fiber contact and interaction with surfaces of the equipment during processing, evidenced by wear over time [3, 6, 8].

There have been many studies of fiber damage during extrusion and compounding [7, 8, 9, 10]. De Cicco conducted studies on fiber damage of a 30% by weight short glass fiber reinforced polyamide 6 in a Couette device [3]. The effect of residence time and melt temperature were examined. De Cicco showed that for residence times greater than 30 seconds the majority of fiber damage has already occurred and no further significant reduction in aspect ratio takes place. However, melt temperature showed a large effect on the average final fiber length, with lower temperatures causing more fiber damage. This was attributed to increasing viscosity, which in turn increased the shear stress in the fibers resulting in greater length reduction.

Fu et al. extruded and injection molded samples of polypropylene reinforced with glass fibers and, separately, carbon fibers for several different volume fractions [6]. The processing for all samples was conducted under similar conditions. Measurements of fiber length showed a decrease in mean fiber length as the fiber volume percentage increased. This is mainly attributed to increased fiber-fiber interaction. Tensile properties were observed to increase with increasing fiber loadings.

Ota et al. compared properties of injection molded polypropylene with fiber volume fractions of 0, 20 and 30% and varying injection temperatures [10]. Measurements of fiber length showed a shorter mean fiber length at 30% Vf (fiber volume fraction) than 20%. The author also notes that at higher viscosities of the polymer melt, greater amounts of fiber damage occur. Increased volume fraction of fiber is shown to increase the tensile properties. Although no notable difference in tensile strength was observed in relation to varied injection temperatures, tensile modulus and impact strength were shown to decrease with increasing injection temperature.

Barbosa and Kenny studied the effect of injection molding processing parameters on two formulations of a glass-filled polypropylene [11]. The parameters chosen as factors in the screening experiment were screw speed, back pressure, barrel temperature profiles, hold pressure, transfer point, injection speed, and hold time. The design showed all factors were significant as main effects or involved in significant 2-factor interactions for the response: impact strength.

Vu-Khanh et al. used a designed experiment to study the influence of six injection molding parameters on the mechanical behavior of a PBT-PET long glass fiber blend [12]. The parameters studied were peak cavity pressure, holding pressure, back pressure, screw speed, melt temperature, and barrel temperature profile. The intention was to screen factors for significance with respect to fiber length, tensile strength, tensile modulus, and impact strength. The author reported that all the parameters and their two-way interactions were significant with respect to fiber damage. It was also observed that most of the main effects and two-way interactions were significant for the abovementioned mechanical properties.

EXPERIMENTAL PROCEDURE

The resin, a commercially available grade of short-fiber glass-filled polypropylene, was received in pellet form compounded with 30% glass fiber by weight. The pellets were approximately 0.125 inch (3.175 mm) in length. A measurement study of the fibers showed a number and weight average fiber length of 0.713 and 0.897 mm, respectively, with a broad distribution (Figure 4). The injection molding parameters selected for study were screw speed, barrel temperature, injection speed, and mold temperature. In order to limit molecular degradation, barrel temperatures were chosen within the manufacturer's recommended range. Cooling time remained constant to keep barrel residence times consistent. Molding parameters for this work were established so that no visual defects were present and the critical dimensions of the gage length (width and thickness) were within specification. A replicated 24 factorial design of experiments was selected for a total of 32 treatment combinations. Table I shows the selected levels for each factor and Table II shows the run order and treatment combination. Since barrel and mold temperature are hard to change a split-split plot design was used. Each of the two replicates was run on a different machine, yielding ASTM Type I and ASTM Type V tensile bars, respectively. The two replicates were blocked to account for the expected variation in machine and tensile specimen type. Tensile strength and tensile modulus were selected as responses and testing conducted in accordance with ASTM D 638 – 03 [13] on an Instron model 3369 test stand with extensometer. The reported testing of the Type-I tensile bars contains data from two to three specimens. A minimum of five Type V specimens per run were tested.

Table I: Factor levels for the studied parameters.

Factors	Low	High
Barrel Temp (°F)	350	425
Mold Temp (°F)	50	140
Injection Speed (%)[1]	15	90
Screw Speed (%)[1]	20	90

[1] *Injection speed and screw speed factor levels were selected as a percent of the maximum machine capability.*

Based on the tensile testing results, the treatment combinations yielding the highest and lowest tensile strengths from runs 1-16 were selected for fiber length measurements. Samples of the tensile bars were removed from the gage length. The samples were placed in a muffle furnace at 900°F for approximately 1.5 hours to remove the matrix material. A sample of virgin pellets was also burned off for initial fiber length measurements. Slides of the fibers were prepared from Run 2, Run 13, and the pellets. The fibers were randomly selected and distributed onto adhesive strips for microscopic evaluation. Measurements of the fibers were performed manually with a Keyence digital microscope. Figure 1 is a micrograph of the fibers from Run 13 at 50x magnification. At this magnification, the fiber ends could be easily selected for measurement.

Table II: Design of Experiments run order with coded variables.

Run	Block	Factor 1 A: Barrel Temp °F	Factor 2 B: Mold Temp °F	Factor 3 C: Inj Speed %	Factor 4 D: Screw Speed %
1	{ 1 }	-1	-1	-1	1
2	{ 1 }	-1	-1	1	-1
3	{ 1 }	-1	-1	-1	-1
4	{ 1 }	-1	-1	1	1
5	{ 1 }	-1	1	-1	1
6	{ 1 }	-1	1	-1	-1
7	{ 1 }	-1	1	1	-1
8	{ 1 }	-1	1	1	1
9	{ 1 }	1	-1	1	-1
10	{ 1 }	1	-1	-1	1
11	{ 1 }	1	-1	-1	-1
12	{ 1 }	1	-1	1	1
13	{ 1 }	1	1	-1	-1
14	{ 1 }	1	1	1	1
15	{ 1 }	1	1	-1	1
16	{ 1 }	1	1	1	-1
17	{ -1 }	-1	-1	1	1
18	{ -1 }	-1	-1	1	-1
19	{ -1 }	-1	-1	-1	-1
20	{ -1 }	-1	-1	-1	1
21	{ -1 }	-1	1	-1	-1
22	{ -1 }	-1	1	1	-1
23	{ -1 }	-1	1	1	1
24	{ -1 }	-1	1	-1	1
25	{ -1 }	1	-1	-1	1
26	{ -1 }	1	-1	1	1
27	{ -1 }	1	-1	1	-1
28	{ -1 }	1	-1	-1	-1
29	{ -1 }	1	1	1	1
30	{ -1 }	1	1	-1	1
31	{ -1 }	1	1	1	-1
32	{ -1 }	1	1	-1	-1

 CONTINUED FROM PAGE 28

Differential scanning calorimetry (DSC) was conducted on samples from Run 2 and Run 13. In order to assess the crystallinity of the polypropylene material, a three-step methodology was utilized. The sample was initially heated through melting at 10 K/minute to 240 °C, control cooled through recrystallization at 10 K/minute, and subsequently reheated through melting at 10 K/minute to 400 °C.

Figure 1: View of the fibers from Run 13 on a slide at 50x magnification.

RESULTS AND DISCUSSION

The tensile strength, modulus and coefficient of variance are reported in Table III. The maximum tensile stress achieved was reported as the tensile strength. The strain at maximum stress was approximately 1.4-2.2% for all samples. A comparison of the coefficients of variance between runs 1-16 and 17-32 shows greater specimen-to-specimen variation in the Type V tensile bars than the Type I. This was attributed to the smaller size of the Type V tensile bar which increased the sensitivity to varying test conditions, such as grip alignment and extensometer placement. Differences in the tensile strength and tensile modulus between runs 1-16 and 17-32 are expected, but statistically accounted for in the experimental design by blocking. Separating the replicates into two blocks and varying the machine size, specimen size, and testing equipment/procedures allows inferences to the ruggedness or robustness of the results.

The design and analysis of this experiment were conducted using Stat-Ease Design-Expert 8 software. The whole plot, subplot, and sub-subplot were analyzed separately with regards to the responses: tensile strength and tensile modulus. The analysis for both tensile strength and modulus showed that barrel temperature and injection speed were significant. Inspection of the diagnostic graphs showed no indications of model assumption violations.

Analysis of the barrel temperature factor for both tensile strength and modulus showed that at the low setting the properties were lower and the high setting resulted in significantly greater tensile properties. For injection speed, the tensile strength and modulus were larger at the low speed and significantly reduced at the high speed.

Table III: Tensile strength and tensile modulus of each run with coefficients of variance.

Run	Tensile Strength (psi)	Tensile Strength COV (%)	Tensile Modulus (psi)	Tensile Modulus COV (%)
1	7207	0.88	8.9E+05	3.27
2	6823	0.81	8.5E+05	1.39
3	7310	0.98	9.1E+05	0.09
4	6945	2.35	9.0E+05	0.88
5	7421	0.92	9.4E+05	0.13
6	7331	0.45	1.0E+06	0.64
7	6925	1.29	8.7E+05	5.63
8	6962	0.78	9.1E+05	3.12
9	7508	0.33	8.9E+05	0.12
10	7921	1.37	9.0E+05	2.26
11	7834	1.06	9.3E+05	2.83
12	7419	1.31	8.5E+05	4.14
13	8026	1.09	9.8E+05	2.62
14	7399	1.00	8.6E+05	4.97
15	7964	0.41	9.2E+05	3.17
16	7327	0.85	8.6E+05	1.04
17	6367	5.86	8.7E+05	12.84
18	6561	3.24	8.1E+05	6.49
19	6932	4.03	9.1E+05	7.15
20	6997	4.38	8.5E+05	6.93
21	7329	0.68	8.9E+05	4.98
22	6770	1.17	7.8E+05	5.58
23	6897	1.10	8.5E+05	4.89
24	7253	2.51	8.6E+05	4.09
25	7168	6.05	1.0E+06	7.90
26	7271	1.47	9.1E+05	10.01
27	7304	2.40	8.9E+05	7.18
28	7356	2.07	9.1E+05	6.71
29	6927	3.64	9.0E+05	8.03
30	7049	3.28	9.7E+05	12.76
31	7151	3.92	1.0E+06	8.96
32	7669	2.96	9.8E+05	7.54

Differential scanning calorimetry was conducted on Run 2 and Run 13, which were molded at differing mold temperatures. The thermograms from Run 2 are shown in Figures 2 and 3. The thermograms show endothermic peaks at approximately 162 - 164 °C. These peaks represent the melting temperature and are consistent with the characteristic melt temperature of polypropylene. Figure 2 also shows an exothermic recrystallization peak at approximately 116°C. The crystallinity of Run 2 was found to be 81.7 % and Run 13 was 77.6 %.

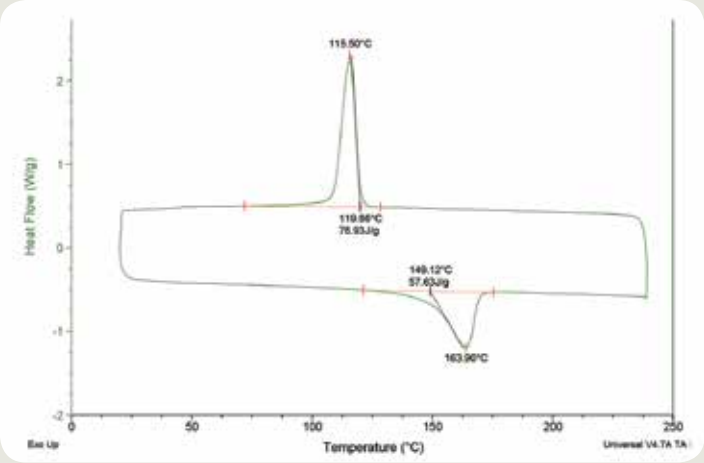


Figure 2: DSC thermogram of Run 2 showing the initial heating and cooling cycles.

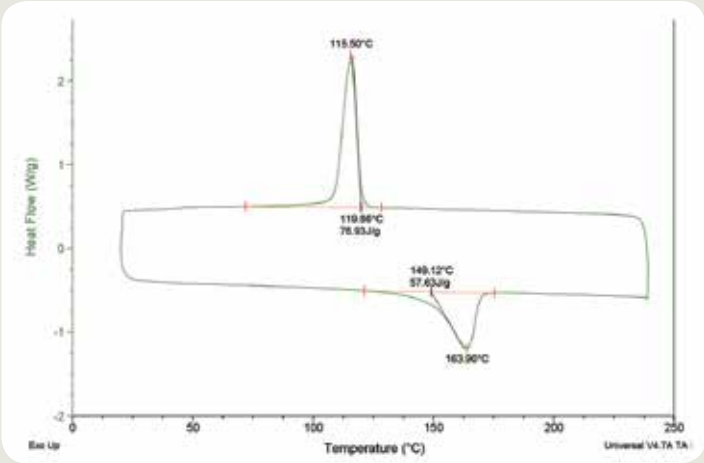


Figure 3: DSC thermogram of the second heating cycle.

Run 2 was molded with high injection speed and low barrel temperature and Run 13 with low injection speed and high barrel temperature. Runs 2 and 13 showed the lowest and highest tensile strength within Runs 1-16, respectively, and were selected for fiber length measurements. The fiber length of the pellets was also obtained. The number average fiber length and weight average fiber length were calculated using Equations 1 and 2.

Equation 1:
Number average fiber length

$$\bar{l}_n = \frac{\sum n_i l_i}{\sum n_i}$$

Equation 2:
Weight average fiber length

$$\bar{l}_w = \frac{\sum n_i l_i^2}{\sum n_i l_i}$$

Where n_i is the number of fibers with measured length l_i. Table IV shows the total number of fibers counted, range, and calculated average fiber lengths for the pellets, Run 2, and Run 13. The individual fiber measurements were sorted into bins of 0.10 mm increments and plotted as a percentage of the overall count in order to view the fiber length distribution. The fiber length distributions for the pellet, Run 2, and Run 13 are shown in Figures 4 – 6. The distributions of the fiber length populations are skewed because when one longer fiber breaks it becomes many individual smaller fibers.

Table IV: Measurement properties for the pellet, Run 2, and Run 13.

	Pellet	Run 2	Run 13
Fiber Count	483	582	723
Min (mm)	0.127	0.076	0.076
Max (mm)	2.896	1.651	2.819
$\bar{l}_n$ (mm)	0.713	0.456	0.558
$\bar{l}_w$ (mm)	0.897	0.551	0.757

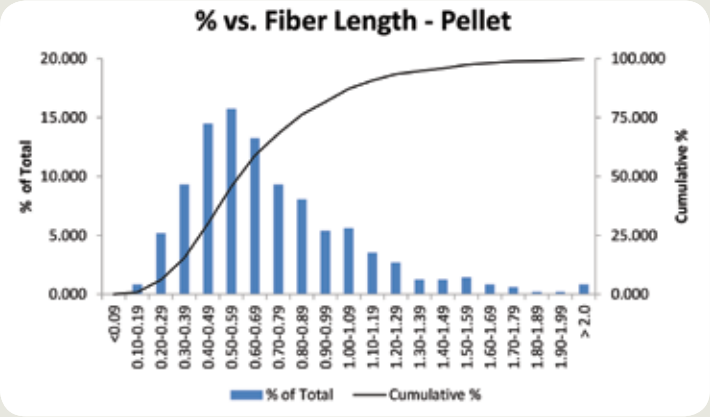


Figure 4: Plot showing the fiber length distribution of the unmolded pellets.

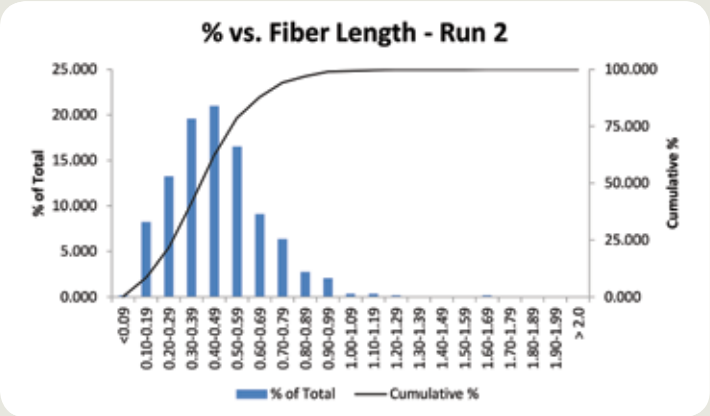


Figure 5: Plot showing the fiber length distribution of Run 2.

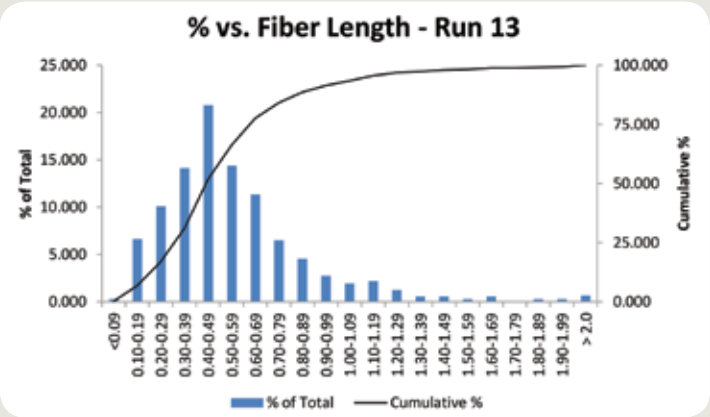


Figure 6: Plot showing the fiber length distribution of Run 13.

The number average and weight average fiber lengths plus tensile strength of the molded specimens for the pellet, Run 2, and Run 13 are shown in Figure 7. The difference between the number average and weight average fiber lengths was observed to increase in the pellet and Run 13 over Run 2. This difference is observed because the longer fibers contribute much more to the weight average fiber length. The weight average fiber length is a better estimation of the mean since longer fibers provide more of the final composite strength in comparison to shorter fibers. The fiber length distributions for each are shown in Figure 8. The pellet and Run 13 show more broad distributions, whereas Run 2 shows a narrow distribution with very few fibers over 1.0 mm.

The process conditions (i.e. high barrel temperature and low injection speed) for Run 13 resulted in better fiber length retention, evidenced by higher tensile properties. Barrel temperature controls the initial viscosity of the resin prior to injection.[2] At low viscosities the polymer flows more easily, resulting in decreased stress on the fibers. Injection speed controls the rate at which the polymer is injected through the runner system and into the mold cavity. Higher injection speeds result in higher fiber stresses during flow and more fiber damage. Therefore, for short-fiber reinforced composites, it is optimal to run higher barrel temperature and slower injection speeds for property retention.

[2] *Viscous dissipation will also contribute to the initial viscosity of the resin.*

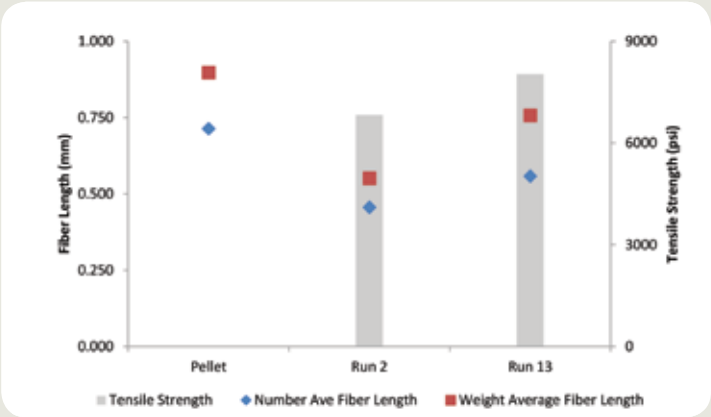


Figure 7: Comparison of the average fiber lengths between the pellets, Run 2, and Run 13.

 CONTINUED FROM PAGE 31

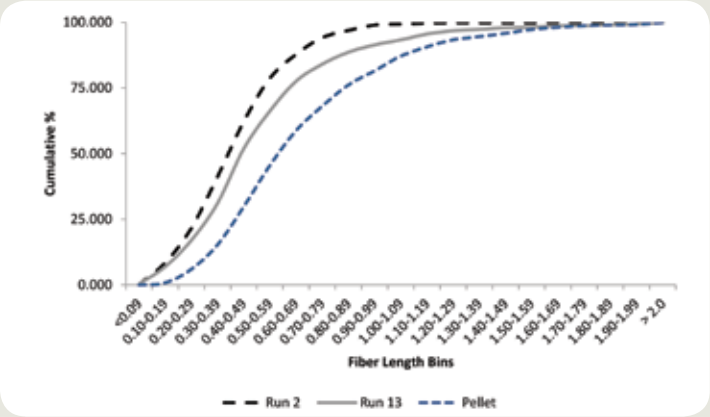


Figure 8: Comparison of fiber length distributions between Run 2, Run 13 and the pellets.

Composite properties depend heavily upon fiber orientation and some have argued that increasing injection speeds result in a higher degree of fiber orientation [14]. Although increasing the fiber orientation in the direction of loading would be expected to result in an increase in tensile properties, this effect appears to have minimal influence in comparison to the fiber length reduction from high injection speeds. Polymer crystallinity can also contribute to the final properties. However, DSC results from the varied mold temperatures detected little difference in final crystallinity of the specimens.

Screw speed controls the shear rate during plastification in the barrel, prior to injection. It is likely that the varied levels of screw speed resulted in different amounts of fiber damage preinjection. However, because differences were not detected in the tensile properties, the screw speed effects were dominated by the effects of resin viscosity and injection speed during the injection phase of the molding cycle. Therefore, fiber damage during the injection phase is dominant in determining the final properties of an injection molded short fiber composite.

The experimental results of the two blocks, runs 1-16 and runs 17-32, showed variation between the replicated treatment combinations, yet robust results with regards to the studied factors. Variation was expected because the two blocks were quite different. However, the significant factors affecting the tensile properties remained the same within blocks. Although differences in mean values of strength and modulus can be expected between different machines, the effects of injection speed and barrel temperature remain the same.

SUMMARY AND NEXT STEPS

A study of the effects of varying injection molding parameters on a glass fiber-filled polypropylene was conducted to assess fiber damage. A two-factor, replicated design of experiments was utilized to screen the factors barrel temperature, injection speed, screw speed, and mold temperature. Tensile strength and tensile modulus were selected as responses. Fiber length measurements of the specimens with the lowest and highest tensile strength were taken from Runs 1-16. These measurements were to confirm that fiber damage was responsible for the reported tensile property differences.

Analysis of the experiment showed that barrel temperature and injection speed were significant with respect to the tensile strength and modulus. The tensile properties were lower at the low barrel temperature setting and higher at the high setting. The properties were also shown to be significantly higher at the low injection speed setting and lower at high injection speed.

Based on the tensile test results, Run 2 and Run 13 were selected for fiber length measurement. Run 2 was molded at the high injection speed and low barrel temperature settings. Run 13 was molded at the low injection speed and high barrel temperature. Run 2 and Run 13 tensile strengths were found to be 6,823 and 8,026 psi, respectively. Fiber length measurements were obtained for the unmolded pellets, Run 2, and Run 13. The pellet showed a weight average fiber length of 0.897 mm. Run 2 and Run 13 showed a weight average fiber length of 0.551 and 0.757, respectively. Thus, injection speed and barrel temperature significantly impacted the tensile properties due to fiber damage.

The study has shown that the most severe fiber damage occurs during the injection phase of the molding process.

During injection the most prevalent fiber damage mechanisms are fiber stress from flow induced rotation in the molten polymer and fiber-fiber interactions. Further study is required in order to determine how to account for each damage mechanism in order to develop a predictive model. Recommendations to further understand fiber damage during injection molding include:

- Optimize a fiber measurement technique that would reduce measurement times, yet accurately estimate the mean.

 CONTINUED FROM PAGE 32

- Conduct a response surface method experiment with injection speed and barrel temperature as factors in order to determine optimal settings and if the effect is linear or curvilinear. Include average fiber length as a response.
- Include resin type, fiber type, and fiber volume fraction as factors in an experiment to study fiber damage with differing materials and fiber loadings.
- Extend the work to long fiber pellets, which have lengths > 0.5 inch.
- Establish a model to predict fiber damage during processing.

ACKNOWLEDGEMENTS

Thank you to my colleagues at The Madison Group and University of Wisconsin-Madison for their willingness to discuss this work and be a sounding board for ideas. I would also like to thank ACCE for the generous grant.

BIBLIOGRAPHY

1. Loken, T.G., "Fiber Damage of a Short-Fiber Composite During Injection Molding," MS-Thesis, University of Wisconsin-Madison, 2011.
2. Papathanasiou, T.D., Guell, D.C., "Flow-induced Alignment in Composite Materials," Woodhead Publishing, 1997.
3. De Cicco, M.P., "An Investigation of Fiber Damage Mechanisms in a Shear Flow Using Glass Fiber Reinforced Polyamide 6," MS-Thesis, University of Wisconsin-Madison, 2001.
4. Osswald, T.A., Menges, G., "Materials Science of Polymers for Engineers 2nd Edition," Hanser, 2003.
5. Mittal, R.K., Gupta, V.B., Sharma, P.K., "Theoretical and Experimental Study of Fibre Attrition during Extrusion of Glass-fibre-reinforced Polypropylene," Composites Science and Technology,1988.
6. Fu, S.-Y. et al, "Tensile properties of short-glass-fiber- and short-carbon-fiber-reinforced polypropylene composites," Composites Part A, 2000.
7. Fisa, B., "Mechanical Degradation of Glass Fibers During Compounding with Polypropylene," Polymer Composites, 1985.
8. Turkovich, R., Erwin, L., "Fiber Fracture in Reinforced Thermoplastic Processing," Polymer Engineering and Science, 1983.
9. Gupta, V.B., Mittal, R.K., Sharma, P.K., "Some Studies on Glass Fiber-Reinforced Polypropylene. Part I: Reduction in Fiber Length During Processing," Polymer Composites, 1989.
10. Ota, W.N., Amico, S.C., Satyanarayana, K.G., "Studies on the combined effect of injection temperature and fiber content on the properties of polypropylene-glass fiber composites," Composites Science and Technology, 2004.
11. Barbosa, S.E., Kenny, J.M., "Processing of Short Fiber Reinforced Polypropylene. II: Statistical Study of the Effects of Processing Conditions on the Impact Strength," Polymer Engineering and Science, 1999.
12. Vu-Khanh, T. et al, "The Effects of Injection Molding on the Mechanical Behavior of Long-Fiber Reinforced PBT/PET Blends," Composites Science and Technology, 1991.
13. Standard Test Method for Tensile Properties of Plastics, ASTM Designation D 638 – 03, ASTM International, 2003.
14. Xavier, S.F., Tyagi, D., Misra, A., "Influence of Injection-Molding Parameters on the Morphology and Mechanical Properties of Glass Fiber-Reinforced Polypropylene Composites," Polymer Composites, 1982.

AUTO EPCON 2013 REPORT

Dr. Gary J. Kogowski

AutoEPCON 2013 was a great success, with 223 participants attending the one-day event co-organized by the SPE Detroit Section and Automotive Division. The participants included 21 members from automotive OEM staffs, 64 who registered, 88 sponsors and guests of sponsors, 27 speakers, 21 SPE board members, and 2 media sponsors. This was a record-breaking attendance for the SPE AutoEPCON. Net income will be split between the SPE Detroit Section and the SPE Automotive Division and used for the education scholarship budget, *Plastivan*, as well as special events such as the "Kids Christmas Toys Program."

How does a successful conference like AutoEPCON evolve you might ask? The answer is through the dedicated and passionate work of our volunteer committee members. This year we created a new volunteer committee position called "Executive Chair." The purpose of this position is to provide the AutoEPCON committee with vision and insight into advanced automotive thermoplastic technology, how it relates to OEM mandates such as the new U.S. Corporate Average Fuel Economy (CAFE) standards, as well as a global perspective of automotive plastic materials. Who better to accept this position than Kathy Minnich, manager, North American Materials Engineering and Testing, Ford Motor Company? Through our meetings with Kathy, the foundation of the conference was born. The AutoEPCON presentation sessions of Design Engineering, Material Development, Lighting, Thermal Management, Processing and Enabling Technologies, and Predictive Engineering were a result of Kathy's input. The theme of the conference "*Meeting Global Mandates with High-Performance Plastics*" was the result of our brainstorming session with Kathy too. The AutoEPCON committee would like to thank Kathy for her significant contributions in 2013 and we look forward to working with her again in 2014.

The Michigan State University SPE student chapter is closely associated with the Detroit Section's board of directors. This growing student chapter is involved in many campus fundraising activities as well as recruitment of new student members into the SPE fold. This year our committee invited Charles Chen, 2012-2013 president of the MSU SPE student chapter to moderate the Fluid Systems session of the conference. Charles did a great job and gained valuable technical conference exposure experience. Many thanks to Charles for a job well done and best of luck in his future graduate studies.

This year we scheduled a new session presented by the American Chemistry Council (ACC) entitled "Roadmap for 2030: Envisioning Plastics in Automotive Applications." This session provided a forum and open discussion among participants who discussed the industry's strategy for using plastics to help enhance fuel efficiency, performance, and design in the auto industry. During this session, participants discussed important questions such as what trends will encourage or constrain the increased use of plastics in making high-performance, energy-efficient and sustainable automobiles? What advances in plastics materials and manufacturing are necessary to ensure plastics meet the needs of OEMs, making plastics a material and partner of choice? The 2-hour interactive

AUTO EPCON

2013 REPORT Continued

session was a great success for both members of the ACC and participants from the automotive industry. For more information regarding "Roadmap 2030," please visit the ACC website at www.americanchemistry.com.

With a record of 22 sponsors, the 2013 AutoEPCON remains a key conference for networking, communicating new product development, and OEM attendance. We are grateful for the support of our Premier Sponsors: DuPont Automotive, DSM, INVISTA Engineering Polymers, Ravago Manufacturing Americas, Styron, and Ticona Engineering Polymers; our Associate Sponsors: Chevron Phillips, Ascend, A. Schulman, Albis, BASF SE, Solvay Engineering Plastics, and SABIC; and our Exhibitors: Addcomp, DME, Element Materials Technology, Hyperion, IHS Inc., Laser Reproductions, Milacron, and Otsuka Chemical Co., Ltd. Thank you to our Break Sponsor Entec Polymers, LLC; Advertisement Sponsor Styrolution; and the many Media & Association Sponsors: Plastics: The Global Application Medium, Automotive NewsWire, Plastics Technology, Plaspec Global Plastics Selector, SAE International®, Automotive Engineering International, TheMoldingBlog.com, PrototypeToday.com, Plastics Engineering, WardsAuto.com, Automotive Design & Production, and AutofieldBlog.com.

Many thanks to our committee members who worked very hard to make the SPE AutoEPCON a success: Dr. Gary Kogowski (co-chair, Ravago Americas), Terry Cressy (co-chair, DuPont Automotive), Sandra McClelland (technical papers co-chair, Chevron Phillips), Laura Shereda (technical papers co-chair), Ed Luibrand (sponsorship chair, Chrysler Group LLC), Glenn Cannavo (committee member, DSM), Keith Siopes (committee member, DSM), Jim Keeler (committee member, Albis), Suresh Shah (committee member, Delphi), Kelly Beauchamp (exhibits and conference center coordinator, DME), Jay Raisoni (committee member, Adell Plastics), Peggy Malanti (web development, sponsorship, media, Malnati & Associates), Teri Chouinard (sponsorship committee member, Intuit Group), and Nippani Rao (emeritus committee member, Chrysler Corp. retired).

The 2014 AutoEPCON is scheduled for May 6, 2014 at the MSU Conference Center, Troy, MI. Please mark your calendars.

9TH-ANNUAL

AUTO EPCON

CALL FOR TECHNICAL PRESENTATIONS

MAY 6 2014

MSU Management Education Center Troy, MI, USA

DEADLINE FOR 50-WORD ABSTRACT: March 1, 2014

DEADLINE FOR PRESENTATIONS: April 8, 2014 No Paper Required

PROGRAM SCOPE The Automotive Division and Detroit Section of the Society of Plastics Engineers (SPE®) invite you to attend a 1-day technical conference & exhibition showcasing innovative developments in the Design, Materials, Processing, & Use of Engineering Plastics for the Global Automotive Industry.

WHO SHOULD ATTEND This conference is specifically designed to inform, update and educate the OEM & supplier communities about advances in both thermoset & thermoplastic engineering polymers. Learn how these widely used materials can help improve performance & productivity, while reducing cost and mass.

PRESENTATIONS Hear technical presentations on the newest advances in engineering materials related to: Design Engineering; Materials Development; Lighting; Thermal Management; Processing & Enabling Technologies; Predictive Engineering; New Applications & More.

EXHIBITS See Exhibits from Engineering Plastics Suppliers, Molders, Compounders, Additives & Reinforcement Suppliers, Design & Engineering Firms, & Machinery Suppliers. Experts will show you how to apply the latest technologies to your next project or program.

CONFERENCE INCLUDES Full Day of Technical Presentations, Plenary & Keynote Presentations on Automotive Business Trends, Lunch & Coffee Breaks, Exhibits of Advanced Technologies and Evening Reception.

Visit www.speautomotive.com/emc.htm, or contact us at karen@spedetroit.com.

Karen Rhodes-Parker, SPE Detroit Section (Ph: +1.248.244.8993 ext. 3)

DETROIT

CO-SPONSORED BY

SOCIETY OF PLASTICS ENGINEERS

DETROIT SECTION & AUTOMOTIVE DIVISION

2013 SPE AUTOEPCON SPONSORS & EXHIBITORS

Ticona Performance Driven Solutions · DSM · DuPont The miracles of science · Invista Engineering Polymers · Ravago · Styron · Albis · Addcomp Polymer Additive Solutions · Ascend · A. Schulman · BASF · Chevron Phillips Engineering Polymers · Sabic · Solvay · Entec · D-M-E · element · IHS · Hyperion Catalysis · laser reproductions · Otsuka · Styrolution · Plastics · Automotive Design · AutoFieldBlog · automotive engineering · Automotive NewsWire · PLASPEC Global · Plastics Engineering · Plastics Technology · Prototype Today · The Molding Blog · SAE International · WardsAuto.com

SOCIAL REPORT

Teri Chouinard, SPE Automotive Div. Social Chair

Corvettes from Zero to 60 – Cool Cars Drive Cool Careers

The next SPE Automotive Div. social event is "*Corvettes from Zero To 60*" at the Buick Gallery at the Sloan Museum in Flint, Michigan. It is scheduled for Thursday, September 19, 2013, from 4 – 8 p.m.

The event is free to SPE Members and guests who may be interested in joining SPE – including students interested in learning about the benefits of being an SPE member and working in the automotive industry. Beverages & hors d'oeuvres are included. Pre-Registration is required via http://spead-social.com.

SPE Automotive Div. members representing OEMs, tier suppliers, and other professionals in the industry will be on hand to network with students and discuss career opportunities available in automotive plastics.

The Buick Automotive Gallery is located on the Flint Cultural Center Campus at 303 Walnut Street, Flint, Michigan 48503. Maps, driving directions, and more info are available at http://sloanlongway.org/.

This year marks the 60th anniversary of the first *Corvette*® sports car rolling off its Flint assembly line, and 60 never looked so good! Come and enjoy this tribute to the crown jewel of American sports cars. The special exhibit displays each *Corvette* body style starting with one of the original 300 "Polo White" "C1" platforms that were hand-built in 1953 through each successive generation since. The exhibit highlights major changes in body styles such as the advent of the original *Stingray*® model in 1963, introduction of their landmark V-8 performance engines, and how the *Corvette* survived 60 years to become an American institution.

The purpose of the SPE Automotive Div. social events is to provide opportunities for networking, to have fun, and to build membership. If you have an idea for a future social event, which may include a tour of your facility or other educational and fun ideas that will interest our membership and draw new members, please email teri@intuitgroup.com or call +1.810.797.7242.

SPE Automotive Division Golf Outing

As we go to press on our September newsletter issue, we have 50 golfers registered for the 2013 SPE Automotive Div. Golf Outing. This year's event takes place on September 9 at Fieldstone Golf and Country Club in Auburn Hills, Michigan and we expect about 100 golfers in total for the event. This year's outing is 2 days before the SPE Automotive Composites Conference & Exhibition (ACCE), so those who are coming into town early can enjoy some fun and relaxation before the event. Our current 2013 Golf Outing Sponsors include:

Plastic Engineering & Technical Services, Inc. – Performance. Value. Delivered.
Ticona – Performance Driven Solutions™
ADDCOMP – Polymer Additive Solutions
BÖHLER UDDEHOLM
iD Additives™
PLASAN – Carbon Composites

Planning already is underway for the 2014 SPE Automotive Div. Golf Outing. This event is a great opportunity to meet people, entertain customers, or just get out for good company and fresh air. To keep things lively and interesting, there are a number of sponsorship opportunities for various contest holes, lunch, and dinner. The sponsorship packages include foursomes (with breakfast and lunch) signage, keepsakes flags with corporate logo, and event recognition including logo on division website.

Next year's SPE Automotive Div. Golf Outing will be held September 7, the day before the 14th-annual SPE ACCE. The timing is great to give SPE ACCE sponsors and attendees a head start on entertaining employees, customers, and suppliers. More details will follow over the coming months and Early Bird sponsorship opportunities, including early recognition on the SPE Automotive Div. Golf Outing web page starting in January 2014 are available. For more information, please contact teri@intuitgroup.com or call +1.810.797.7242.

SPE Golf Outing 2013

AUTOMOTIVE SPE®

Drive Home a Powerful Marketing Message With a Hard-Hitting Sponsorship Program

2013 Sponsorship Opportunies

There are a number of promtional opportunites available for this year's SPE Golf Outing.

Type of Sponsorship:	Cost:	Benefits Include:
Contest Hole	$1000. USD	1 foursome, signage, flag & more
Hole	$750. USD	1 foursome & signage
Lunch	$2000. USD	2 foursomes, signage & 100 fliers printed & ditributed 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 & ditributed at the event promoting sponsoring company or its products

http://speautomotive.com/golf

Contact Teri Chouinard for more details.
Intuit Group • Ph 810.797.7242 • Fax 810.797.7243
teri@intuitgroup.com

Monday, September 9 2013

Fieldstone Golf Club
1984 Taylor Road
Auburn Hills, MI 48326
USA

Cost:
$500. USD / Foursome
$125. USD / Player

Program:
8:30 am – Sign-in & Continental Breakfast
10:00 am – Shotgun Start
Box Lunch at Turn
3:30 pm – Buffet Dinner
4:00 pm – Awards & Prizes

FIELDSTONE GC
CITY OF AUBURN HILLS

TOPCON 2014

"THE WESTERING OF THERMOSETS"

Feb. 24-26, 2013

JOIN US.

- Nightly rates of $169 per night
- Outdoor Gala Reception, live entertainment
- Golf Outing TBA
- Technical papers being accepted

TUCSON, ARIZONA

SPE's hottest conference will be held Feb. 24–26 at the Loews Ventana Canyon Resort. SPE Thermoset Division will present the most recent developments in thermoset composite technology. Guest speakers will represent the mining, medical, appliance, food service, oil and gas, electrical and automotive industries.

Join us for the SPE Thermoset Golf Outing at Loews Ventana Canyon's championship golf course. Arrive early for the golf and the world famous Tucson Rodeo! Bring the family!

WWW.SPETHERMOSETS.ORG

630.247.6733

PLANNED & MANAGED BY GRAPEVINE MARKETING & EXPERIENCES

WWW.GVINEME.COM

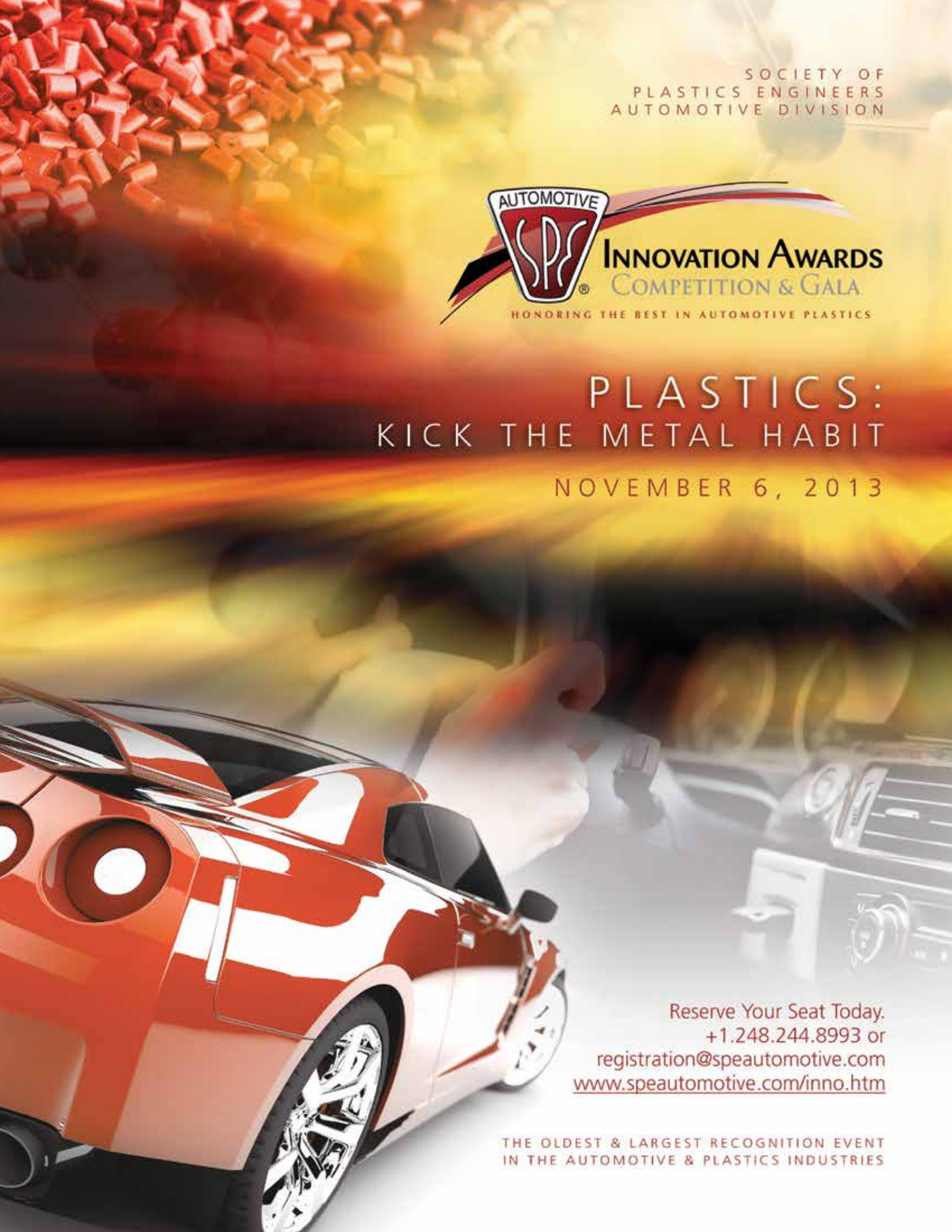
EDUCATION REPORT

by Monica Prokopyshen, Education Chair

Marjorie Weiner of SPE's headquarters provided a summary of the PlastiVan™ Program and funding requirements for school visits at our June board meeting. The SPE Automotive Div. funded 27 days of science and technology education to 4,655 middle and high school students in Southeast Michigan this fiscal year, an increase of 7 days. Some of the increased demand resulted from local TV coverage of the "Chemistry and Designing with Plastics" workshops held during the Explorathon® career fair, March 20, 2013 in Troy, Michigan. Consolidation of several Michigan sections also factored into increased funding requests to the SPE Automotive Div. this year.

New PlastiVan requests received at the end of the school year have been added to the 2013-2014 PlastiVan schedule. During the fiscal year 2012-2013, we funded $36,450 (27 days). For next year, 30 days of funding (at a cost of $40,500 USD) has been proposed.

The board will finalize the policy for evaluating college student funding requests in August.


SOCIETY OF
PLASTICS ENGINEERS
AUTOMOTIVE DIVISION
AUTOMOTIVE
SPE
INNOVATION AWARDS
COMPETITION & GALA
HONORING THE BEST IN AUTOMOTIVE PLASTICS
PLASTICS:
KICK THE METAL HABIT
NOVEMBER 6, 2013
Reserve Your Seat Today.
+1.248.244.8993 or
registration@speautomotive.com
www.speautomotive.com/inno.htm
THE OLDEST & LARGEST RECOGNITION EVENT
IN THE AUTOMOTIVE & PLASTICS INDUSTRIES

SECRETARY'S REPORT

SPE Automotive Division Board Meeting Minutes, June 10, 2013

Next BOD Meeting is August 12, 2013

ATTENDEES

Yvonne Bankowski
Ed Garnham
Brian Grosser
Jeff Helms
Elizabeth Johnston
Ed Luibrand
Peggy Malnati
Al Murray
Kevin Pageau
Tom Pickett
Monica Prokopyshen
Nippani Rao
Ron Price
Suzanne Cole
Dawn Stephens
Steve Van Loozen
Margie Weiner
Jake Welland

The meeting was held at the American Chemistry Council's Automotive Center office and via conference call, 5:30–6:30 p.m. April minutes were approved.

COUNCILOR'S REPORT – Tom Pickett

The full Councilor's report is in the June newsletter. Tom provided a summary of the April 21, 2013 councilor's meeting held in Cincinnati, Ohio and highlighted SPE President, Jim Griffing's vision of SPE in a changing world. Themes from the book Race for Relevance were discussed with respect to attracting, retaining and growing membership. The current average age of an SPE member is 52 and the U.S. is the main membership country. The SPE board of directors discussed networking approaches for young professionals. The proposed policy change to TopCon revenue sharing was hotly debated. In particular, the board discussed recent service issues with SPE headquarters registration, Director and Officer Liability insurance, risk sharing, and potential disincentives for new TopCon launches.

EDUCATION – Monica Prokopyshen

The board will finalize criteria for student funding. Marjorie Weiner from SPE headquarters provided a summary of the PlastiVan™ Program and funding requirements for school visits in the fiscal year of 2013-2014. Details are provided in the Education Report.

TREASURER'S REPORT – Jackie Rehkopf

Bank Account: Checking $167,500 USD & Savings $27,400 USD
PayPal: $65,300 USD
Total Financial Assets: $259,200 USD as at May 17, 2013

MARCOM – Peggy Malnati

2013 ACCE – There are now 52 paid sponsorships and a new Michigan Economic Development Corp. (MEDC) scholarship was announced. To date, 66 paper offers have been accepted and a tutorial track was launched this year with 5 topics. Michael Connolly (former SPE Automotive Div. board member) has been named the 2013 *SPE Composites Person of the Year*. The show smartphone application will be rolled out around August 1st. Last year there were 636 official attendees at the show.

AWARDS GALA – The confirmed date is November 6, 2013 at Burton Manor, Livonia, Michigan. There was good pickup on the press release for this year's Lifetime Achievement winner, Roy Sjöberg.

SPE AD Website – An all-time monthly traffic record for the division's website of 46,393 unique hits/month was reached in March—a 10,358 hit increase over the previous high.

SPE AD Newsletter – The 44-page June issue features fresh new page designs along with the popular technical and celebrity columns. Doug Smock (Batter's Box) provides his top 5 bio-material picks in "Automotive Bioplastics Update: What's Hot, What's Not," and SPE Auto. Div. board member and treasurer, Dr. Jackie Rehkopf is in the spotlight in "An Engineer's Life."

Misc. Marcom – The *Engineer's Life* columns are now available on the SPE Automotive Div. blog (http://speautomotive.org/), and the Batter's Box columns will soon join the blog. Unique web hits continue to show significant year over year gains.

NEW BUSINESS / OTHER

Three new judges were nominated for the Innovation Awards Blue Ribbon Judging. Board members were asked to forward their TopCon Revenue Sharing policy change concerns to outgoing division chair, Jeff Helms.

TREASURER'S REPORT

Jackie Rehkopf

SPE Automotive Division's finances are in excellent standing as we approach the ACCE 2013. As of August 7, 2013, there is $132,200 USD in our checking account; $27,400 USD in savings, and another $96,500 USD in PayPal with a further $25,000 pending there. Total in all accounts is $281,100 USD.

WHO STANDS BEHIND THE PERFORMANCE OF YOUR HOT RUNNER/MANIFOLD SYSTEM?

At Plastic Engineering & Technical Services, we will.

We define performance. Our engineering team is Expert Gold certified and the recognized industry leader in the use of leading-edge analytical tools. We bring more than 25 years of hot runner design, manufacturing and plastic processing experience into every analysis we do. No one else in the industry has the tools in their arsenal that we have. We offer mold filling, mold cooling, shrink & warp analysis, gas assist analysis, injection compression, co-injection and more.

Once the first analysis is completed, we re-analyze it, utilizing a different software to cross check the results, to ensure accuracy. We help you increase your efficiency, reduce costs and improve product integrity.

We deliver value. We were the first hot runner manufacturer to use Mold filling software as part of our daily business and more than ever, we're committed to your success. Contact us for your mold filling analysis and your manifold build, and we will do whatever it takes to make sure our hot runner/manifold system works to your complete satisfaction, and stand behind its performance.

Call us today at 248.373.0800 or visit us at www.petsinc.net.

PLASTIC ENGINEERING & TECHNICAL SERVICES, INC.

Performance. Value. Delivered.

Society of Plastics Engineers
Automotive Division
1800 Crooks Road, Suite A
Troy, MI 48084 USA

AUTOMOTIVE DIVISION HOTLINE

ph: 248.244.8993 • web: www.speautomotive.com • email: info@speautomotive.com

DIVISION OFFICERS & EXECUTIVE COMMITTEE

Yvonne Bankowski, Chair
Ford Motor Co.
(313) 673.8776

Jeff Helms, Immediate Past-Chair
Ticona Engineering Polymers
(248) 377.6895

Vincent Holmes, Chair-Elect
Channel Prime Alliance
(810) 969.2141

Elias Shakoor, Vice-Chair
Center for Automotive Research (CAR)
(313) 456.3006

Jackie Rehkopf, Treasurer
Plasan Carbon Composites
(248) 924.3823

Monica Prokopyshen, Secretary
Retired - Chrysler LLC
(248) 608.6259

Tom Pickett, Division Councilor
General Motors Co.
(248) 431.9724

Josh Madden, Director Emeritus

Dr. Allan Murray, Director Emeritus
Allied Composite Technologies LLC
(248) 814.8072

Nippani Rao, Director Emeritus
RAO Associates
(248) 444.1753

COMMITTEE CHAIRPERSONS

Anthony Gasbarro, ANTEC
Marubeni Specialty Chemicals, Inc.
(248) 721.0276

Monica Prokopyshen, Education
Retired - Chrysler LLC
(248) 608.6259

Steven Van Loozen, Membership
BASF
(734) 552.2864

Jeff Helms, Awards Program
Ticona Engineering Polymers
(248) 377.6895

Fred Deans, Golf Outing
Allied Composite Technologies LLC
(248) 760.7717

Teri Chouinard, Social, Sponsorship
Intuit Group, LLC
(810) 797.7242

Peggy Malnati, Communications, Webmaster, Intersociety, Newsletter Editor
Malnati & Associates
(248) 592.0765

BOARD OF DIRECTORS

TO MAY 2014

Kevin Pageau (248) 835.4999
Sonoco Protective Solutions

Jackie Rehkopf (248) 924.3823
Plasan Carbon Composites

Dr. Suresh Shah (248) 635-2482
SPE

Mark Lapain (248) 567.5455
Magna International

Dr. Norm Kakarala (248) 655.8483
Inteva Products, LLC

Ed Luibrand (248) 512.0641
Chrysler Group LLC

Peggy Malnati (248) 592.0765
Malnati & Associates

TO MAY 2015

Bonnie Bennyhoff (734) 429.9845
ExxonMobil Chemical

Fred Deans (248) 760.7717
Allied Composite Technologies LLC

Dr. Jay Raisoni (248) 659.8232
Retired - Inteva Products, LLC

Chuck Jarrett (248) 417.4390
SABIC

Ed Garnham (248) 379.1729
Retired - General Motors Co.

Brian Grosser (248) 941.9368
Samsung Chemical USA

Anthony Gasbarro (248) 721.0276
Marubeni Specialty Chemicals, Inc.

TO MAY 2016

David Reed (734) 674.0736
Retired - General Motors Co.

Mike Masserant (313) 805.4833
Ford Motor Co.

Suzanne Cole (810) 750.3863
Miller-Cole LLC

Peter Bejin (313) 319.2242
Ford Motor Co.

Ron Price (248) 563.6343
Global Polymer Solutions

Mike Whitens (313) 805.5932
Ford Motor Co.