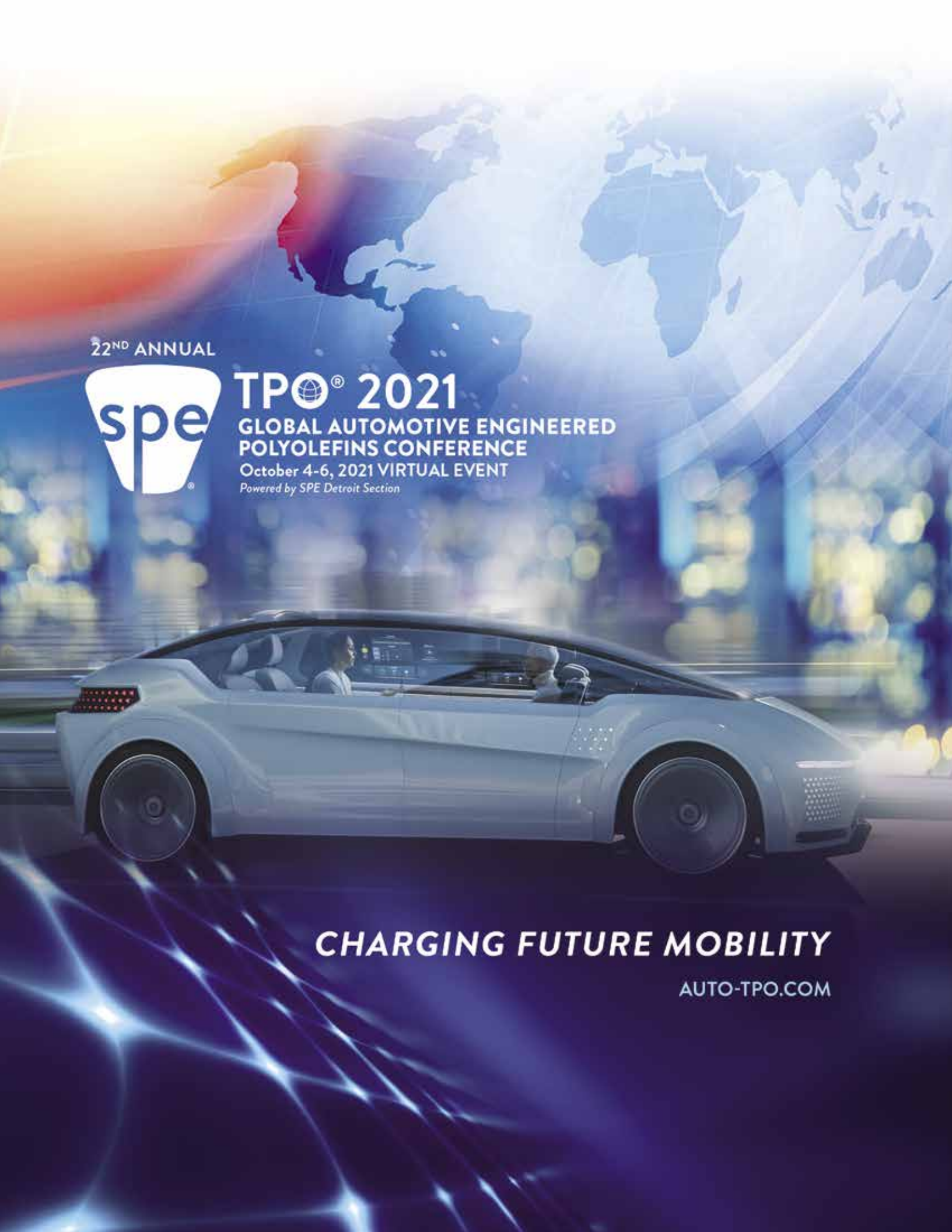
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October 4-6, 2021 VIRTUAL EVENT
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GLOBAL AUTOMOTIVE ENGINEERED POLYOLEFINS CONFERENCE

October 4-6, 2021 VIRTUAL EVENT

Powered by SPE Detroit Section

The Society of Plastics Engineers ("SPE"), Planning Committee and Detroit Section would like to welcome you to the 2021 SPE TPO Automotive Engineered Polyolefins Conference.

As a reminder, the safety of our attendees and organization remains our top priority. This event will be virtual due to the recommendations of the United States Centers of Disease Control and Prevention ("CDC") and travel restrictions in order to slow the spread of COVID-19.

Although this year looks different from our previous conferences, we are proud to continue into our third decade of hosting this event. In our 22nd year, we are focusing on the key drivers and challenges, as well as exploring solutions for this rapidly evolving industry, including electrification and sustainability.

The TPO Conference strives to further strengthen the core fundamentals and value for the mobility industry, by providing the latest polyolefin technical information and enabling networking opportunities that span across the entire automotive segment. Areas that we are proud to showcase include our comprehensive technical program, featured keynote speakers, latest innovations and emerging technologies that reinforce our 2021 theme of '***Charging Future Mobility***'.

We thank you for attending, and would like to highlight some items this year:

- Extensive OEM participation – our committee, speakers, and also attendees. Our 2021 Executive Chair is Dr. Cynthia Flanigan from the Ford Motor Company.
- We're proud to represent and reach a truly global audience – we expect attendees and participants from over 20 countries.
- We've assembled a comprehensive technical program that features 4 Keynote Addresses and 70 Technical Presentations in 8 different technical sessions.
- We feature a diverse field of virtual platinum and gold sponsors and exhibitors to fully interact, schedule meetings and exchange ideas with.

We would also like to thank and recognize our industry speakers for our four Keynote Addresses and the Technical Program. We have listened to your feedback and understand that having this component of the conference is important to help our attendees better understand the latest trends. We know that you will leave this event better informed and connected as the industry collectively works to drive automotive plastics forward.

Finally, please join us in acknowledging the efforts of the 46 voluntary Planning Committee members as well as our industry partners – our sponsors – that help us achieve success. They have worked diligently to bring this year's program to you in a new, virtual setting. It is our desire to move forward with the 2022 TPO Conference in person featuring a virtual option (hybrid), and will keep you updated as our work progresses.

Please enjoy the next two and a half days at the TPO Conference. We encourage you to provide feedback of what went well, what did not, and any suggestions you have for the future. We look forward to having you with us again in 2022.

Neil Fuenmayor,
LyondellBasell

John Haubert,
Stellantis

Bill Windscheif,
Advanced Innovation Solutions, LTD

TECHNICAL
PROGRAM HIGHLIGHTS

Extremely challenging for most of us to quickly learn and adapt to the digital format of the conference content delivery. The Technical Program Team has heavily relied on our wizard Rob Philp to guide us on the process of pre-recording and delivering the presentations in a virtual environment. We thank our presenters for accommodating all our requirements and supporting to run the program to your liking.

The technical program features 8 technical sessions with 70 presentations covering a broad spectrum of topics at this conference. We used three concurrent session tracks on two full days and two session tracks on the third half day of the conference in scheduling the presentations. All program content (full schedule, presenter's pictures, bios, short abstracts and recording of presentations) is available at your fingertips on the digital platform. Please access it and make your plan on attending the talks of your interest.

We have been continuously improving program quality year after year for over 20 years. In addition to 6 continuing technical sessions, we are offering two highly relevant and important new sessions: one on Sustainability with focus on recycle, recovery, and reuse of materials and the other session on Innovations for the Future Mobility. Two to three Co-Chairs for each of the 8 sessions have shared the responsibility in recruiting quality presentations and work-out all the logistics in gathering required documentation in a timely manner. The session chairs have the complete autonomy in running their session for providing greater value to the participants. We are fortunate to recruit superb quality presentations on cutting edge technologies. The Program Schedule provides details of the session chairs and their affiliations.

We value the experience and wisdom of our veteran Session Chairs such as Dr. Rose Ryntz, Bob Eller, Mike Balow, Dr. Suresh Shah, and others who have been guiding us since the start of this conference. They provide us insights in selecting the session topics, recruiting presenters, and mentoring volunteers to join the conference organization committee. We are grateful for their continued guidance and support.

Session Chair's mission is to ensure both the presenters and the participants have pleasant experience and receive enhanced value with the interactions. While you are attending the presentations please use the chat line to post your questions to the presenter. Based on the available time after the presenter concludes the talk, the session moderator will facilitate discussions with Questions and Answers. We urge you to engage the presenters in discussion for elaboration of details and improved clarity of the subject discussed. The presenters will be delighted to address any questions and gratified with the interest you showed in asking for clarification. Further the value of the conference improves with the dialogue and discussion during the conference. We find the Q & A process is more efficient and productive in a virtual conference avoiding peripheral distractions and noises in a physical conference room setting. Exceptional benefit this year is all Q & A will be recorded and available for review by all participants at their convenience.

We believe strongly that we gain greater value with personal interactions with presenters at a conference than simply listening to the talks. Please seek out the presenters with provided links on-line and get to know and engage them in discussions for improved learning. Remember both you and the presenter have a commonality of interest on the same technical topic.

Thank you for supporting the conference with your participation. Please provide us feedback on what you liked and how we can improve. More importantly we seek your support for next year event (hopefully both on-site and on-line) in volunteering to organize a session (by recruiting presenters) or join the organizing committee (for managing sponsorships and exhibits).

Dr. Norm Kakarala,
SPE Fellow and Honored Service Member

Dr. Alper Kiziltas,
Ford Motor Co.

David Helmer,
General Motors Co.

TRIBUTE TO NIPPANI RAO

rest in peace

Our dear friend and colleague,

Nippani passed away early Tuesday evening, January 19, 2021, at Beaumont Hospital, Farmington Hills. He was 81. Nippani was born November 15, 1939, in Hyderabad, Telangana, India, to the late Bhimsen and Ghodavri (Baru) Nippani. He married Joan M. (Burns) on February 28, 1969, and together they enjoyed nearly 52 years of marriage. In addition to his wife, Nippani is survived by three sons, David, Eric, and Stephen (Michelle); and siblings, Rama Nippani and Lakshmi Veena. In lieu of customary remembrances, those who wish to further honor his memory are invited by his family to consider a contribution to the Wounded Warrior Project.

Pat Farrey, SPE CEO said: Nippani was an active member of the Society of Plastics Engineers, where he received the "Honored Service Member" award – the highest award for service to the Society and the industry. His friends and colleagues at the Society appreciated and respected him, both personally and professionally. We share his family's sadness."

Nippani was a long time Board member of the SPE Detroit Section, the SPE Automotive and the SPE Composites Division. His kindness and leadership helped create the success of all three chapters and he will be greatly missed by so many. He was a chair of the SPE Automotive Div. Lifetime Achievement and Automotive Innovation Hall of Fame Awards and served as a judge on the Blue Ribbon Committee for the SPE Automotive Innovation Awards and ACCE Part Competition and played a leadership role on numerous other committees for many years.

Nippani was one of the Detroit SPE TPO's founders and was active in the TPO Conference since its inception in 1999. He was most recently the Chair of the Detroit SPE Awards Committee and the Annual Golf Outing but had served in many roles in support of the Section over the years.

Nippani worked as a materials engineering supervisor at Chrysler from 1986 – 2008; Technology manager at Asahi Kasei from 2008 – 2010; and as president of RAO Associates from 2009 until his death. One of the highlights of his career was the engineering responsibility of the award-winning Dodge Viper Body innovations with resin transfer molding. He held numerous patents. He held Chemical Engineering degrees from Xavier University and the University of Cincinnati and an MBA in marketing from Xavier University.

The Detroit Section will not be the same without Nippani. He is remembered for his good humor, his smile, his kindness, his wisdom and willingness to serve.

TRIBUTE TO NIPPANI RAO

rest in peace

Tributes:

In 2009, when I became a member of the SPE Detroit Section Board of Directors, one of the first people to welcome me to the Board was Nippani Rao. During that time, we worked together on several committees, including the Awards Committee and the Golf Outing Committee. When I became Awards Committee Chairperson, Nippani shared his extensive experience in helping me to understand this new responsibility. He was an excellent coach and mentor, and I learned this new role very quickly thanks to his support.

Nippani always enjoyed bringing members of the SPE Detroit Section together for social gatherings. In 2013, Nippani led a committee to bring back an event to the Detroit Section Calendar that had not be held in years; the SPE Detroit Section Golf Outing. Since then, this event has now become a major fund-raising event to support educational programs in the Detroit Area.

Nippani is gone, but his contributions to the SPE both in Detroit and on the international level will never be forgotten. We will miss him deeply. — ***Pete Grelle***

"Nippani was very close friend and SPE colleague since 1990. I will always cherish the beautiful memories working together at several SPE events with his amazing dedication. I will miss going out for a leisurely lunch at his favorite Indian restaurant "Biryani Express". He will be greatly missed but his kindness, smile, good attitude and gentle spirit will be remembered forever. With love and deepest sympathy as we remember a very dear friend". — ***Suresh Shah***

Nippani gave me a lasting impression as warm and kind gentleman albeit briefly via my interview for the SPE Detroit Section board member position. I cherish the interactions at our in-person board meetings and will always remember him fondly. — ***Fang Wang***

When I heard that Nippani had passed away the day before, it was like a giant sack of rocks had fallen on my head. Nippani and I have worked on SPE together for 20 years. We golfed together, roomed together for 6 years when he served as councilor for the Automotive Division, and I had the same position for the Detroit Section. Nippani always volunteered for committee chair positions. He became the chair for the Divisions at Council several of the years we worked together. Everyone got along with Nippani, and I never saw him without a smile on his face. He will be missed, and I feel very fortunate to have had him as a friend. — ***Tom Powers***

I worked with Nippani in the past and keep very good memories of him. Visiting FCA with him was like walking with a celebrity! He will be missed. My thoughts and prayers to his family. — ***Rodrigo Orozco***

Nippani was one of the most genuinely kind and supportive members of the SPE Automotive Division.

Nippani was always so nice to work with and very helpful to me personally. I will miss dearly and always remember his warm smile. — ***Teri Chouinard***

I am very sad and surprised to hear about Nippani's passing. Nippani has made significant contributions to the Detroit Section and the committees he has served on over many years. He will absolutely be missed. — ***Laura Shereda***

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MONDAY, OCTOBER 4, 2021

AGENDA 2021

7:00 AM — CONFERENCE OPENS / REGISTRATION

8:30 AM — **WELCOME REMARKS:** Conference Co-Chair, **Neil Fuenmayor,** LyondellBasell

8:40 AM — **KEYNOTE INTRODUCTION: Neil Fuenmayor,** LyondellBasell
EXECUTIVE KEYNOTE: Changing World, Changing Needs, Changing Materials, **Dr. Cynthia Flanigan,** Ford Motor Co.

9:15 AM — **KEYNOTE INTRODUCTION: Neil Fuenmayor,** LyondellBasell
KEYNOTE: The Future of Mobility, **Mark Barrott,** Plante Moran

9:50 AM — **TECHNICAL PROGRAM HIGHLIGHTS: Dr. Norm Kakarala / David Helmer,** General Motors Co. / **Dr. Alper Kiziltas,** Ford Motor Co.

10:05 AM — VIRTUAL NETWORKING BREAK

	TRACK-I	TRACK-II	TRACK-III
	MATERIALS DEVELOPMENT **Mark Jablonka,** Dow **Peter Glenister,** LyondellBasell **Catherine Wilson,** Ford Motor Co.	**SURFACE ENHANCEMENTS & COATINGS** **Dr. Rose Ryntz,** Ryntz & Associates **Jeff B. Crist,** Ford Motor Co. **Jim Keller,** Mankiewicz Coatings, LLC	**INTERIOR APPLICATIONS & LAMINATING ADHESIVES** **Dr. Pravin Sitaram,** Haartz Corporation **Austin Wagenhals,** Ford Motor Co. **Hoa Pham,** Freudenberg Performance Materials
10:15 AM	TALC: An Active Ingredient for Polymers Modification Towards Lightweighting Approach **Piero Ercoli,** ImiFabi	The Evolution in Surface Enhancements for Automotive Plastics **Dr. Rose Ryntz,** Ryntz & Assoc.	TPO and TPE Opportunities in Smart / Electric Vehicle Auto Interiors **Robert Eller,** Robert Eller Associates LLC
10:50 AM	New Innovative Concentrate Solutions for Automotive Applications **Brian Hanrahan,** Celestial Minerals	The Evolution of Flame Surface Treatments in Defiance of Conventional Wisdom **Jamie Brynolf,** FTS Technologies	Lightweight Low Force Tearing (LFT) TPO for Foam in Place Applications **J. Ryan Bailey,** Continental
11:25 AM	Innovative Solutions to Broaden Polypropylene Glass Fiber Filled Compounds Usage for Structural Applications **Luca Gazzola,** Sirmax SpA	AD-Pro Zero™ - A Powder Slurry Adhesion Promoter **David Detzler,** Clear Skies Powder Coatings	Grain Retention Improvement and Measurement for TPO First Surfaces **Dr. John O'Gara*, Brett Wreggelsworth, Cameron Gibbins,** Inteva Products LLC

12:00 PM — MID-DAY VIRTUAL NETWORKING BREAK

	MATERIALS DEVELOPMENT	SURFACE ENHANCEMENTS & COATINGS	INTERIOR APPLICATIONS & LAMINATING ADHESIVES
1:00 PM	Polypropylene Compound for Under-The-Hood Applications **Dr. Bin Sun*, D. Brands, L. Havermans, T. Syed,** SABIC	Approaches for Next Generation Adhesives for TPO Bonding **Arthur Cawley*, Thomas P Clark,** Dupont-Mobility and Materials	New Crosslinked Olefin Foam for Soft Touch Automotive Instrument Panels **Paul Sieradzki,** Toray Plastics (America), Inc.
1:35 PM	Surface Appearance Improvement in Glass Reinforced Polypropylene Compounds **Alberto Prieto,** LyondellBasell	Surface Enhancements with UV-Curable Organic Coatings **Timo Lindenau,** Mankiewicz Coatings LLC	PP Foams for Ultra-Lightweight Automotive Interior Applications **Kevin DeGrood,** Borealis Group
2:10 PM	Flame Retardant (FR) Glass Fiber Reinforced Polypropylene **Tariq Syed*, Bin Sun, Jose Sales Fernandez,** SABIC	Effect of Slip Additive on TPO Wear **Kwanghae Noh,** Texas A&M University	The Phenotypic Properties' Effect on the Foam's Level of Light Transmittance **Keigo Shimura*, Kevin O'Malley, Rie Matsui,** Sekisui Voltek LLC
2:45 PM	Tailoring Melt Strength of PP Using an Additive **Bret Robb,** Total Cray Valley	Case Studies with Silicone Masterbatch: Improvements in Flow, Mold Release, and Coefficient of Friction **Mike McCormack*, Dale Zevotek, Emily Vrbensky,** SACO AEI Polymers	Foamed PP Compounds for Aesthetic Automotive Interior Applications **Dr. L. Havermans*, J. Zhang, G. Kwakkenbos, R. Chu, A. Yanev, D. Bande,** SABIC

3:15 PM — VIRTUAL NETWORKING BREAK

	MATERIALS DEVELOPMENT	SURFACE ENHANCEMENTS & COATINGS	INTERIOR APPLICATIONS & LAMINATING ADHESIVES
3:30 PM	Santoprene™ High Resilience TPV in Static and Semi-Dynamic Seals **Dr. Bhavesh Shah,** ExxonMobil	Enabling New Materials, Properties, and Finishes with PPG's Ambient Reactive Extrusion (ARE) Additive Manufacturing Technology **Cindy Kutchko,** PPG Industries, Inc.	Biobased Polyols for Automotive Application **Wolfgang Geuking*, Nathan Noyes, Erwin Honcoop,** Croda Inc.
4:05 PM	Reducing Thermal Expansion of a TPO Panel by Polyolefin Elastomer Selection **Mark Jablonka*, Jeff Munro** Dow	Comparison of Analytical Methods of Volatile Organic Compounds Used in Vehicle Interior Materials **Rocco Rizzo*, Bixi Cha, Jeffery Fisher,** Applus Reliable Analysis	Lightweight Thermoplastic Elastomers for Automotive Applications **Jaykm Battle,** Kraiburg TPE Corp.
4:50 PM	Innovative SEBS for Improving the Key Properties of TPEs **Sherry Takagi,** Asahi Kasei Corporation	New Standards: A Must for Labeling in the Plastics Industry **Jason Brownell,** Polyfuze Graphic Corporation	Styrenic Based TPEs with Superior Flow Properties for Automotive Interior Mats **Stephen Cranney,** Kraiburg TPE Corp.

5:30 PM — VIRTUAL NETWORKING

6:00 PM — CONFERENCE CLOSES FOR THE DAY

TUESDAY, OCTOBER 5, 2021

AGENDA 2021

All times EST USA

7:00 AM — **CONFERENCE OPENS / REGISTRATION**

8:30 AM — **WELCOME REMARKS:** Conference Co-Chair, **John Haubert,** Stellantis

8:40 AM — **KEYNOTE INTRODUCTION: John Haubert,** Stellantis
KEYNOTE: Innovations and Trends in Automotive Plastics, **Dr. Sid Asthana,** Magna Exteriors

9:15 AM — **CONFERENCE SPONSOR RECOGNITION INTRODUCTION: Dr. Sassan Tarahomi,** Alterra Holdings

9:20 AM — **PLATINUM SPONSOR CONFERENCE RECOGNITIONS**

10:05 AM — **VIRTUAL NETWORKING BREAK**

	TRACK-I	TRACK-II	TRACK-III
	MATERIALS DEVELOPMENT **Mark Jablonka,** Dow **Peter Glenister,** LyondellBasell **Catherine Wilson,** Ford Motor Co.	**SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE** **Mike Balow,** Auxin Consulting, LLC **Susan Kozora,** IAC Group **Mark Allen,** Dow	**INNOVATIONS IN PLASTICS FOR FUTURE MOBILITY** **David Helmer,** General Motors Co. **Andrew Sanders,** Borealis Compounds
10:15 AM	3D Printing Advanced Materials for the Future **Dr. Jake Fallon,** Braskem	The Great Plastics Distraction: How "Environmental Groups" Obsession with Plastic Has Actually Harmed the Environment **Chris DeArmitt,** Phantom Plastics	Future Mobility Trends Affecting TPO Applications **David Helmer,** General Motors Co.
10:50 AM	Stabilization of MIC TPO, Concepts that Can Drive Higher Performance **Nancy Cliff,** BASF	Pursuit of Sustainability Through Lifecycle Thinking **Rich Helling,** Dow	Battery Pack Optimization with Polypropylene Materials for Next-Gen Electric Vehicles **Dave Sullivan*, John Waters,** SABIC
11:25 AM	Sustainable Bio-Based Additive Reinforced TPOs for Automotive Applications **Sassan Tarahomi,** Alterra Holdings	Plastics and Sustainability in 2021 **Patrick Krieger,** Plastics Industry Association	Radar Transparency of Thermoplastic Olefins (TPO's) for Bumper Fascia **Dr. Jane Lu*, Charlie Yang,** LyondellBasell

12:00 PM — **MID-DAY VIRTUAL NETWORKING BREAK**

	APPLICATIONS FOR BIOBASED MATERIALS **Dr. Alper Kiziltas,** Ford Motor Co. **Akshay Trivedi,** General Motors Co. **Drew Geda,** Hyundai Motor Group	**SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE** **Mike Balow,** Auxin Consulting, LLC **Susan Kozora,** IAC Group **Mark Allen,** Dow	**INNOVATIONS IN PLASTICS FOR FUTURE MOBILITY** **David Helmer,** General Motors Co. **Andrew Sanders,** Borealis Compounds
1:00 PM	A Study on Fiber Length Distribution of Glass Fibers in an Injection Molded PP Composite **Sandeep Tamrakar,** Ford Motor Co.	Challenges and Opportunities for Polyolefins within an Emerging Circular Economy **Geoffrey Inch,** Braskem	Boron Nitride Enabled Cable Insulation Material **MD. Golam Rasul,** University of Illinois
1:35 PM	Blue Agave Fiber – A Lightweight and Renewable Filler for Polymer Composites **Amy Langhorst,** Ford Motor Co.	The Role of Plastic Additives in Improving the Properties and Durability of Recycled Automotive Plastics **Nancy Cliff,** BASF	Versatile Halogen-Free Flame-Retardant Polypropylene Composites for Lightweight Electric Car Applications **Florian Schuetz,** Borealis
2:10 PM	Viscoelastic Properties of Basalt-Hemp Hybrid Reinforced PP **Kyleigh Rhodes,** Washington State University	Circular Economy Solutions: Borealis Strategy, Infrastructure for PCR and PIR Supply, Product Examples **Andrew Sanders,** Borealis	3D Printing with Polypropylene-from Prototypes to Production Parts **Dustin Kloempken,** HP, Inc
2:45 PM	Hybrid Composites Based on Polysaccharides and LGF **Christian Lenges,** International Flavors & Fragrances	Advanced Additive Technologies for Upcycling **John Mara*, Jenji Yamashita,** Adeka	Weight Reduction of Plastic Components with the latest Technology **Trevor Pruden,** Arburg

3:15 PM — **VIRTUAL NETWORKING BREAK**

	APPLICATIONS FOR BIOBASED MATERIALS **Dr. Alper Kiziltas,** Ford Motor Co. **Akshay Trivedi,** General Motors Co. **Drew Geda,** Hyundai Motor Group	**SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE** **Mike Balow,** Auxin Consulting, LLC **Susan Kozora,** IAC Group **Mark Allen,** Dow	**LIGHTWEIGHTING OF POLYOLEFIN PARTS** **Mike Shoemaker,** Borealis Compounds **Normand Miron,** Washington Penn Plastic Co., Inc. **Dr. Nadeem Bokhari,** Sumika Polymers NA
3:30 PM	VOC Analysis of Various PP Fiber Reinforced Composites Designed for Automotive Interiors **Kyleigh Rhodes,** Washington State University	A Recycled Content Material Solution for TPV Applications **Edgar Gonzalez,** Synesis LLC & LyondellBasell	THERMOFIL HP® High Performance Light-Weighting Polyolefins Using CAE **Nicolas Schlutig, Hideaki Nishio,** Sumika
4:05 PM	Hemp Fiber Filled Composites **Greg Dean,** The Hemp Plastic Company	Incorporating Micronized Rubber Powder into Composites to Increase Sustainability in Automotive Applications **Annabel Sharnowski,** University of Michigan	Carbon Fiber for Lightweighting **Mark Evans,** Borealis
4:50 PM	Conducting the Change Using Thermoplastics Filled with Hemp Fibers in Automotive Industry **Jean-Marie Bourgeois-Jacquet** Automotive Performance Materials	Addressing Viability of Collecting and Recycling Automotive Plastics **Andy Brewer,** Plastics Industry Association	Light Weight Solutions for Automotive Applications **Charlie Yang,** LyondellBasell

5:30 PM — **VIRTUAL NETWORKING**

6:00 PM — **CONFERENCE CLOSES FOR THE DAY**

WEDNESDAY, OCTOBER 6, 2021

All times EST USA

7:00 AM	**CONFERENCE OPENS / REGISTRATION**	
8:30 AM	**REMARKS AND TRIBUTE TO NIPPANI RAO:** Conference Co-Chair, **John Haubert,** Stellantis	
8:40 AM	**KEYNOTE INTRODUCTION: David Okonski,** General Motors Co. **KEYNOTE:** Sustainability in the Automotive Industry & Life Cycle Management Strategies for TPO **Speakers: Professor Lenny Koh and Dr. Alicyn Rhoades** **Professor Lenny Koh,** Advanced Resource Efficiency Centre (AREC), Partnership and Internationalisation of the Energy Institute at The University of Sheffield **Dr. Alicyn Rhoades,** Plastics Engineering Technology at Penn State University - Behrend	
9:15 AM	**CONFERENCE SPONSOR RECOGNITION INTRODUCTION: Dr. Sassan Tarahomi,** Alterra Holdings	
9:20 AM	**PLATINUM SPONSOR CONFERENCE RECOGNITIONS**	
10:05 AM	**VIRTUAL NETWORKING BREAK**	
	TRACK-I **PROCESS DEVELOPMENTS** **Matt Sprouse,** Washington Penn Plastic Co., Inc. **Dr. Suresh Shah**	**TRACK-II** **SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE** **Mike Balow,** Auxin Consulting, LLC **Susan Kozora,** IAC Group **Mark Allen,** Dow
10:15 AM	Process Development Revolution with IT4.0 **Dr. Arash Kiani,** Alterra Holdings	Enabling Sustainability through Post-Consumer Recycle Content in TPO **Robert Mimms,** Advanced Composites Inc.
10:50 AM	Disruptive Innovation – Digital Polypropylene – 3D Printing **David Tucker,** Forecast 3D	Automotive Shredder Waste: A Marketing Challenge **Jeff Spangenberger,** Argonne National Laboratory
11:25 AM	How and When to Inject Super Critical Fluids into a Twin-screw extruder to Improve TPE/TPO Compounding Processes and Products **Charlie Martin,** Leistritz Extrusion Company	CirKular+ solutions for Plastics Recycling **Amit Desai,** Kraton
12:00 PM	TPO Compounding 2030: Past, Present Future of Twin Screw Extrusion **Cameron Kheradi,** Coperion Corporation	Inteather™ Material Solutions for a Sustainable Future **Kevin Lyons,** Inteva Products LLC
12:35 PM	3D Additive Manufacturing **Trevor Pruden,** Arburg	Summary and Reflection Regarding Sustainability, Reuse, Recovery, and Recycling **Mike Balow,** Auxin Consulting, LLC, **Mark Allen,** Dow **Susan Kozora,** IAC Group
1:05 PM	**VIRTUAL NETWORKING**	
3:00 PM	**CONFERENCE CLOSES FOR THE YEAR**	

Revision 13

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TerraFlex® 5300 Series
TerraFlex® 6100 Series
TerraFlex® 7100 Series

TerraPrene®

TerraPrene® is based on TPV, which is an alloy of Polypropylene and EPDM wherein the EPDM phase is dynamically vulcanized

TerraPrene® V1100 Series
TerraPrene® V2100 Series
TerraPrene® V2100-HF Series
TerraPrene® V1700 Series
TerraPrene® V2700 Series

TerraBio®

TerraBio® are products which are biobased and/or are biodegradable (including compostable and anaerobic) digestible

TerraBio ® Series

TerraLite®

TerraLite® is a series of foamable/. expandable and optionally crosslinkable compounds

TerraBio ® Series

NexGen®

X-Linked Butyl Rubber, partially cross linked Butyl Rubber.

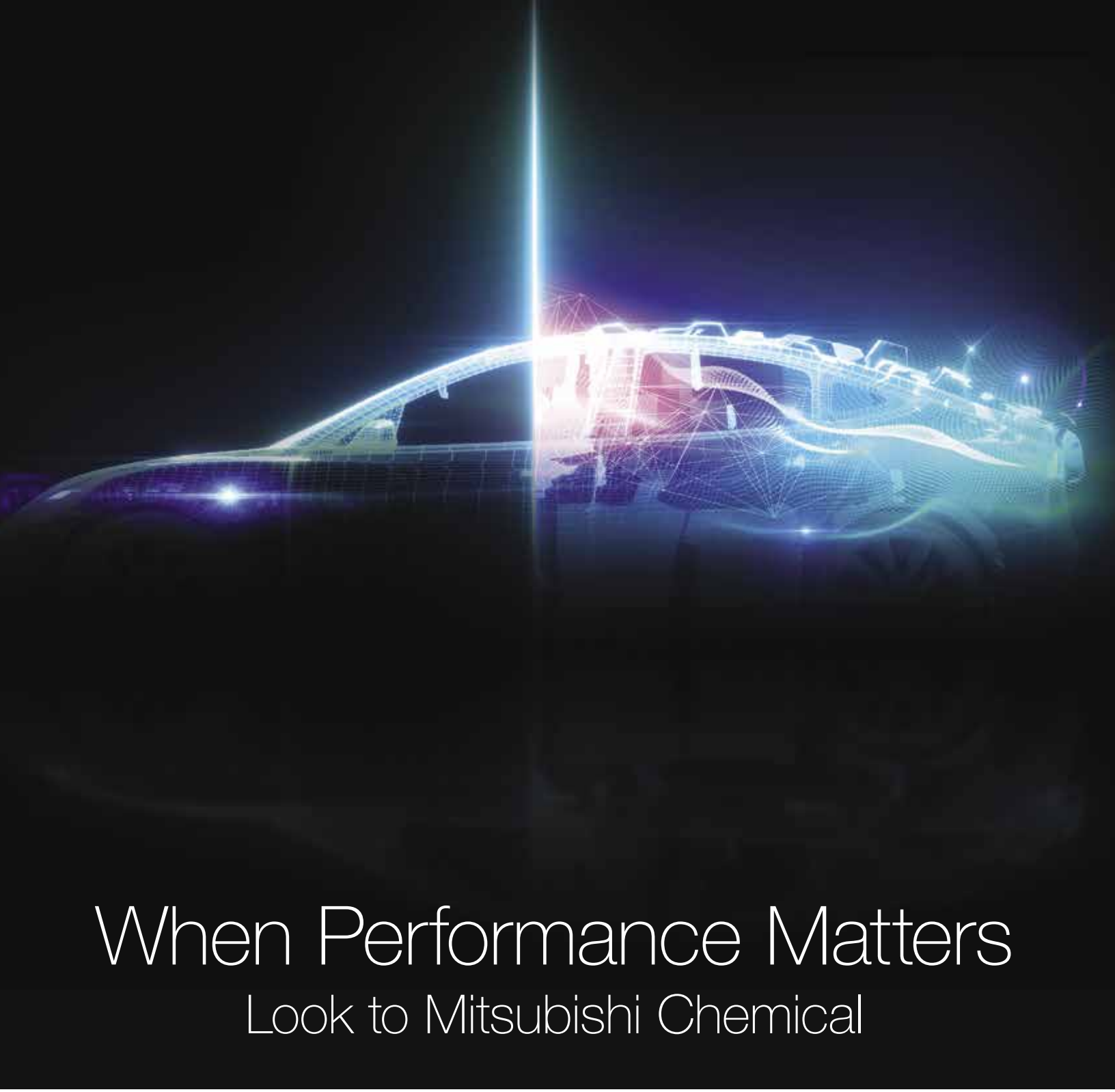
NexGen ® Series

TerraSilk®

ThermoPlastic Additives/Modifiers

TerraSilk ® Series

TerraFlex®	TerraPrene®	TerraBio®	NexGen®	TerraLite®	TerraSilk®
TPE	TPV	Bio-Based Polymer	X-Linked Butyl	Foamable Expandable Compounds	Additives



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Mitsubishi Chemical and our group companies are dedicated to bringing high performance material solutions to the automotive market. With decades of innovative research and development in thermoplastic materials such as TPO, LGFPP, TPE, TPV and more, Mitsubishi Chemical is your ideal partner for the ultimate in range, innovation and value.

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2021 SPONSORS

2021 KEYNOTE SPEAKERS

Now in its third decade, the **22nd Annual SPE® TPO Automotive Engineered Polyolefins Conference** is the world's leading engineered polyolefins forum, highlighting 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 event is planned to be an **ALL NEW VIRTUAL FORMAT** featuring real-time, remote presentations from 70+ technical sessions, occurring over 3-days as well as select keynote speakers. The conference will be held October 4-6, 2021, virtually for all participants, promising an even greater global scope of participation.

The conference will showcase talks by keynote speakers from Ford Research and Advanced Engineering, Plante Moran, Magna Exteriors, and Advanced Resource Efficiency Centre (AREC-USA). The theme of this year's 2021 technical conference and exhibition is ***"Charging Future Mobility".***

CYNTHIA FLANIGAN

The conference keynotes take place each morning and will kick off Monday, October 4 with an opening keynote by **Dr. Cynthia Flanigan, Chief Engineer of Vehicle Research and Technology within Ford Research and Advanced Engineering.** She is also the Conference Executive-Chair. Her talk titled, "***Changing World, Changing Needs, Changing Materials,"*** will elaborate on the automotive industry and its need to respond to societal and workplace changes, with emphasis on the circular economy and new technologies for personal and shared mobility. In response, many options that emphasize electrification, ride-share, self-driving and micro-mobility will be offered. "The world is changing at an unprecedented rate, giving us a tremendous opportunity to address the changing needs of our customers both today and for the future," notes Flanigan.

She will present current global trends and interesting R&D efforts that support solutions for the new functional requirements these changes demand. Ford's efforts in the development and implementation of sustainable and advanced thermoplastic olefins including nano and bio fillers, materials from recycled feedstocks, bio inspired and advanced functional materials will be featured.

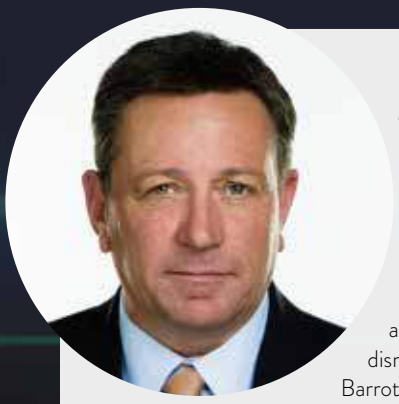
Dr. Cynthia Flanigan is the Director of Vehicle Research and Technology within Ford Research and Advanced Engineering. In this capacity, she leads a global team of researchers to develop products over a broad technical portfolio including additive manufacturing for design, materials and processing methods, advanced interiors, exteriors and safety features, architectural design and chassis systems, novel materials, manufacturing technologies, and analytical tool development. During her 20 years with the company, Cynthia has led research projects in a variety of polymer-based applications, including tires, composites and polyurethane foams. Her technical work on developing biomaterials such as soy based polyurethane foam, led to implementation on seating for all Ford vehicles built within North America. Cynthia has received several key awards such as the R&D100, the SAE International Environmental Excellence in Transportation Award, the Henry Ford Award and several SPE Automotive awards. In 2020, she received recognition as one of the Automotive News' Rising Stars in the Automotive Industry and in 2019 was featured in the Ford women's Power Suit campaign including faux cover on the Better Homes and Gardens. Cynthia also recognition as one of the Automotive News' Rising Star in the Automotive Industry in 2017.

Dr. Flanigan has been awarded 8 U.S. patents and 2 international patents for bio-product and elastomers discoveries, has published over 35 external publications, and co-authored two book chapters. Within Ford, Cynthia has had an opportunity to serve on the PDLP Advisory Committee, HFTA Committee, Mustang Council and M.I.T. recruiting team. In 2020, she co-sponsored the Women of Ford-R&A chapter and R&A Leadership Development Rotation Pilot. She recently served as the Chair for the Industrial Advisory Board of CenTire, Tire Research Center located at Virginia Tech. and Board Member for Society of Plastics Engineers, Automotive Division.

Cynthia received Materials Science and Engineering degrees from M.I.T. (B.S.) in Cambridge, Massachusetts and Northwestern University (Ph.D.) in Evanston, Illinois.

Dr. Flanigan will discuss changes in the automotive industry and its need to respond to societal and workplace changes, with emphasis on the circular economy and new technologies for personal and shared mobility. Many material options are being researched and developed to support electrification, autonomous vehicles and commercial vehicles. She will present current global trends and interesting R&D efforts that support solutions for the new functional requirements these changes demand.

Ford's efforts in the development and implementation of sustainable and advanced thermoplastic olefins including nano and bio fillers, materials from recycled feedstocks, bio inspired and advanced functional materials will be featured. "The world is changing at an unprecedented rate, giving us a tremendous opportunity to address the changing needs of our customers both today and for the future," notes Flanigan.



MARK BARROTT

Also on Monday, October 4, the conference's second keynote will feature **Mark Barrott** of **Plante Moran.** His keynote titled, ***"the Future of Mobility"*** will focus on autonomous vehicles, mobility as a service (MaaS), and electrification and how they are disrupting the auto industry. According to Barrott, "While there's disagreement over how fast and how far the trends will grow, they're likely to act as an accelerant for each other and move increasingly fast once they reach a tipping point. It is essential for OEMs, suppliers, and other firms in the value chain to track the progress of each of these three trends as they interact and enable one another to get ready for the fourth one — a massive reorganization of the manufacturing value chain. Companies need to understand the position their products and services occupy along the industry's ultimate commercialization pathway." During his presentation attendees will learn more about these trends and how they will affect every step in the automotive value chain — including design, assembly operations, supplier manufacturing, retailing, financing, and public and private infrastructure — going forward. The presentation will also address how quickly autonomous vehicles, MaaS, and electrification will converge to reinvent the automotive industry; questions you should be asking to prepare for inevitable, sweeping changes; and action items you'll need to execute so you don't get left behind.

Mark works in Plante Moran's consulting practice helping automotive and mobility industry OEMs and suppliers to build strategies to adapt and respond to changing automotive market dynamics, develop new business models and identify organic and non-organic growth plans.

Mark has 30 years of consulting experience. He has advised many OEM and supplier senior client teams on a broad range of strategic initiatives including new market entry, strategic planning, global expansion, operating model design, supply chain, mergers & acquisitions and corporate strategy development and implementation.

Prior to joining Plante Moran, Mark was a Partner with Deloitte. Mark has extensive global experience, starting his career in the UK before moving to the US. Mark co-authored the "Future of Mobility" whitepaper and is a frequent speaker at industry events.

SID ASTHANA

On October 5, Tuesday's keynote will feature **Sid Asthana, Global Director, Materials Engineering, Magna Exteriors.** His talk will feature an in-depth discussion titled, ***"Innovations and Trends in Automotive Plastics."*** Asthana will share how advanced plastics are already shaping future mobility, including the impact of increased electrification and the shift toward autonomy.

As Global Director of Materials Engineering for Magna Exteriors, Dr. Asthana has responsibility for materials used in automotive exterior parts supplied to vehicle manufacturers.

Prior to joining Magna Exteriors, Dr. Asthana was Global Director, Materials Research and Development for Federal Mogul's Seals and Gaskets business unit. He has worked for automotive Tier 1 and Tier II suppliers for nearly 20 years.

Dr. Asthana is a member of the Society of Plastics Engineers, the Society of Tribology and Lubrication Engineers and the American Chemical Society. He holds a Doctorate in Polymer Science from the University of Akron and a Master of Science in Chemical Engineering from the University of Toledo.

ALICYN RHOADES & LENNY KOH

On Wednesday, October 6, **Professors Lenny Koh** and **Alicyn Rhoades** will describe the present state of sustainability in the automotive industry relative to other major industrial sectors, specifically addressing the supply chains available for TPO in their keynote titled, ***"Sustainability in the Automotive Industry and Life Cycle Management Strategies for TPO.",*** Aspects of materials life cycle on environmental sustainability will be described. Dr. Rhoades will describe the state of the art in TPO recycling and the impact that implementing new TPO recycling technologies and circular economy strategies may have on life cycle management strategies, including the potential to repurposing value streams for waste automotive polyolefins. Professor Lenny Koh is the Founder and Director of the Advanced Resource Efficiency Centre (AREC) and the Head of Communication, Partnership and Internationalisation of the Energy Institute at The University of Sheffield. She is an advisor and on the Board of diverse organisations internationally advising leadership and management on resource efficiency and sustainability. Her work contributes to advancing the understanding and resolution of complex supply chains using interdisciplinary approaches crossing supply chain management and information systems domains. Her research is world leading and is recognised for its scientific novelty and has generated significant impacts for societies, governments and industries from manufacturing to services globally. She is also the pioneer of SCEnAT Cloud based suites supported by Microsoft including SCEnAT, SCEnAT+, SCEnATi and SCEnAT 4.0.

Dr. Alicyn Rhoades is an Associate Professor in Plastics Engineering Technology at Penn State Behrend and the Director of the Advanced Resource Efficiency Center in the USA (AREC-USA). Dr. Rhoades has several industrial and government funded research programs, including an NSF CAREER Award and past funding from General Motors, focused on improving polymer solidification models to enhance polymer flow simulation calculations of shrink and warp. In addition, she is an advisor to regional initiatives in plastics recycling in Pennsylvania.

Dr. Rhoades also leads the technical efforts of Moxietec, a small company developing new methods thick thermoplastic foams.

MATERIALS DEVELOPMENT

SESSION CO-CHAIRS:
Mark Jablonka, Dow; **Peter Glenister,** LyondellBasell; **Catherine Wilson,** Ford Motor Co.

MONDAY MORNING: 10:15 AM TO 12:00 PM

TALC: An Active Ingredient for Polymer Modification Towards Lightweighting Approach

Pierogiovanni Ercoli Malacari,
IMI Fabi Spa

Increasing production of zero or low emission vehicles requires the use of very specific solutions to compensate for the weight of large battery packs, minimizing every single component's mass contribution. Thanks to their high performance and low specific gravity, plastic materials can offer versatile and effective solutions. Functional minerals like TALC actively contribute to the optimization of mechanical performance, enabling successful execution of a lightweighting strategy. Together with the regular product ranges, IMI Fabi has developed new product families to exceed standard expectations for Polyolefins and TPOs modification. In this paper both NeoFill and ProTalc families will be showed, highlighting their role in lightweighting applications in TPOs in comparison with current proposed solutions.

New Innovative Concentrate Solutions for Automotive Applications

Brian Hanrahan,
Celestial Materials

The quickened development pace and shifting needs of automotive plastics demands enhanced formulas for reinforcement, lightweighting, recyclability, flame retardancy (FR), electrostatic discharge (ESD), and more. Seamlessly integrate hard-to-handle powder or liquid additives using novel 90%+ masterbatches. Each formula is designed for dust-free handling and agglomerate-free dispersion at higher throughput rates. This paper investigates the application of this technology and its performance benefits with carbon nanotubes, carbon fiber, hollow spheres, FR additives, and more in automotive formulations.

Innovative Solutions to Broaden Polypropylene Glass Fiber Filled Compound Usage for Structural Applications

Luca Gazzola,
Sirmax SpA

PP-GF filled compounds are a convenient material solution for substitution of metal or engineering polymers to reduce the weight of structural applications. However, the mechanical strength of PP-GF compounds is lower than PA-GF, especially at elevated temperatures. Moreover, when standard PP-GF compounds are exposed to permanent stress at high temperatures, several limitations occur, and formulation improvements are necessary in order to consider these materials as viable alternatives.

We conducted studies to develop a series of Isoglass PP glass fiber compounds with significantly improved creep performances, ultimately increasing part life cycle performance before failure. Long term tensile creep results are presented, also considering the effect of weld lines. Finally we present an automotive application as a case study.

MONDAY AFTERNOON: 1:00 PM TO 3:15 PM

Polypropylene Compounds for Under the Hood Applications

Dr. Bin Sun*, D. Brands, L. Havermans, T. Syed,
SABIC

For under-the-hood applications, thermoplastic polyolefin (TPOs) have emerged as an alternative to engineering plastics like nylons. These TPO grades are closing the gap between the conventional engineering resins in mechanical and temperature performance. Additionally, polyolefin materials offer lower density for potential weight savings and a lower overall carbon footprint and cost versus engineering resins for the same applications.

This study underscores this development by presenting the suitability of a short glass-filled polypropylene for air intake manifolds, supported by various property tests per ISO and predictive engineering methods.

MATERIALS DEVELOPMENT

Surface Appearance Improvement in Glass Reinforced Polypropylene Compounds

Alberto Prieto,
LyondellBasell

Glass reinforced polypropylene compounds have been used in the automotive industry for a variety of structural applications for underhood and interior/exterior brackets and retainers where properties such as stiffness, tensile strength and elevated temperature performance are critical; however, applications for these products are limited to non-visible surface appearance parts. LyondellBasell has developed novel short glass fiber reinforced polypropylene compounds aimed for interior applications where aesthetics are demanded. These products are enhanced through selection of key raw materials and process optimization that allow them to be used in the interior of the vehicle specifically where mechanical performance, imparted by glass fiber is important along with surface appearance, scratch performance, color and emissions. Compared to engineering resins these novel products offer ease of processing, cost advantage and weight reduction.

Flame Retardant (FR) Glass Fiber Reinforced Polypropylene

Tariq Syed*, Bin Sun, Jose Sales Fernandez,
SABIC

Flammability control is a critical requirement for materials in various industry segments including automotive. Use of engineering resins is common in vehicle applications. However, polyolefin materials are evolving and emerging as competitive alternatives, offering good mechanical performance at a lower density and cost.

This session will present a portfolio of glass-fiber reinforced polypropylene, non-halogenated FR grades, which includes both short- and long-glass fibers. The latter grades provide excellent creep resistance, long-term property performance, and low warpage; which further make the case for use of polyolefin materials in automotive applications.

Tailoring Melt Strength of PP Using an Additive

Brett Robb, Total Cray Valley

Low-level addition of Dymalink 9200 into polypropylene imparts high melt strength for applications where melt stretching or drawing are critical. Dymalink 9200 creates a temperature-dependent, dynamic network in PP-based homopolymers, copolymers, and elastomers that promote processability and performance in extrusion, thermoforming, and foaming applications. Additionally the boost in melt strength increases the utility for post-industrial and post-consumer materials.

MONDAY AFTERNOON: 3:30 PM TO 5:30 PM

Santoprene™ High Resilience TPV in Static and Semi-Dynamic Seals

Dr. Bhavesh Shah,
ExxonMobil Chemical Company

Santoprene™ thermoplastic vulcanizates (TPVs) are a workhorse material for a variety of automotive sealing applications. Santoprene™ High Resilience (HR) TPV offers improved resilience, elastic recovery and lower compression set over conventional TPVs. Due to its performance properties, Santoprene HR TPV is a viable replacement for EPDM rubber currently used for semi-dynamic weatherseal applications, and has also been evaluated for use in dynamic weatherseals.

Reducing Thermal Expansion of a TPO Panel by Polyolefin Elastomer Selection

Mark Jablonka*, Jeff Munro, Dow

Replacing metal with TPO in exterior closure applications provides significant weight savings, along with cost savings for low-volume builds, benefiting both ICE and EV's, yet challenges with stiffness and thermal expansion exist. In this study the polyolefin elastomer component of TPO formulations was changed, multi-gated molded panels fabricated and tested to quantify performance. Benefits observed in laboratory test specimens translate to actual panels. Results demonstrated that thermal expansion can be reduced by polyolefin elastomer selection.

MATERIALS DEVELOPMENT

Innovative SEBS for improving the key properties of TPEs

Sherry Takagi,
Asahi Kasei Corporation

Asahi Kasei is a world leading supplier of innovative hydrogenated styrenic thermoplastic elastomers (SEBS: TUFTECTM and S.O.E.TM). In this session, we will introduce unique SEBS grades suitable for obtaining soft touch surface, abrasion resistance, and vibration damping properties which are required for automotive interior parts. Also, the modified SEBS grades that can drastically improve the adhesion strength between TPEs and engineering plastics (ie. PA, PPS) will be introduced.

TUESDAY MORNING: 10:15 AM TO 12:00 PM

3D Printing Advanced Materials for the Future

Dr. Jake Fallon,
Braskem

The recent growth of the Additive Manufacturing (AM) industry has prompted a surge of developments centered around making AM a viable process for end-use part production. Braskem has been designing new materials tailored specifically for AM technologies. These custom engineered materials can then be leveraged in conjunction with design optimization software to create lighter weight components for a variety of applications without compromising on mechanical strength. Braskem's new materials enable many opportunities for the future of mobility.

Stabilization of MIC TPO, Concepts that Can Drive Higher Performance

Nancy Cliff*, Dr. Gregor Huber,
BASF Corporation

As the use of TPO for automotive components increases and evolves, performance demands also continue to increase. Optimized thermal and light stabilizer systems are essential to meet these requirements.

This presentation will provide an overview of thermal and light stabilizer technologies. It will show how advanced stabilizer systems can significantly boost performance over conventional thermal and light stabilizer systems and will present strategies to meet the most demanding durability requirements for automotive applications such as molded in color.

Sustainable Bio-Based Additive Reinforced TPOs for Automotive Applications

Sassan Tarahomi,
Alterra Holdings

All sustainable biobased reinforcements, additives or polymer materials are very different in many ways from other man-made materials. A typical process engineer at an injection molding or extrusion or even a thermoforming facility is generally familiar with processing the man-made materials such as PP, PE, PA6 with or without reinforcement like Glass Fiber or a filler like Talc or CaCo3. Biobased polymers, reinforcements and fillers processing require a great understanding of the material properties and processing techniques. Objective of this technical presentation is bringing to attention of engineering community specially the processing engineers the critical aspects of processing biobased reinforcements.

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SURFACE ENHANCEMENTS

SESSION CO-CHAIRS:
Dr. Rose Ryntz, Ryntz & Associates; **Jeff B. Crist,** Ford Motor Co., **Jim Keller,** Mankiewicz Coatings, LLC

MONDAY MORNING: 10:15 AM TO 12:00 PM

The Evolution in Surface Enhancements for Automotive Plastics

Rose A. Ryntz,
Ryntz & Associates, LLC

Surface enhancements in Automotive Plastics have evolved over the last 30 years since the introduction of reactive injection molding (RIM) urethanes utilized in bumpers. The swing in surface decoration has shifted from basecoat/clearcoat coatings on fascia to urethane coated coverstocks for interior crafted components. As the components utilized have changed the need for more appropriate testing methods to assure durability, from adhesion to anti-microbial characteristics, has also evolved.

This presentation will discuss the advancements made in plastic material types utilized for various components as well as the coatings developed to attain required specifications and aesthetics. Some of the more esoteric testing requirements will also be explained, such as adhesion, scratch and mar, and anti-microbial efficacy.

The Evolution of Flame Surface Treatments in Defiance of Conventional Wisdom

Jamie Brynolf,
FTS Technologies

As materials, coatings, and performance requirements evolve, the need for flame surface treatments to adapt to the environment has forced an evolution in the technology that defies conventional wisdom. In particular, shifts towards reductive flame chemistries and away from conventional oxidative mixtures has demanded a new understanding into the objectives of a flame surface treatment and how we control these types of processes for real whole applications.

AD-Pro Zero™ – A Powder Slurry Adhesion Promoter

Dave Detzler,
Clear Skies Powder Coatings

Clear Skies Coatings (CSC) has recently received a patent for a zero VOC, Zero HAP, halogen free adhesion promoter. Known as Ad-Pro Zero™, this powder slurry combines the performance and environmental benefits of a powder coating but in an easy to apply liquid form.

The advantages of using TPO are well known – easy to mold and low cost. However, TPO is notoriously difficult to paint. In Europe a flame or plasma treatment is usually employed to partially oxidize the surface before painting and in North America a liquid adhesion promoter is used. However, as pointed out in Ryntz and Yaneff in Coatings of Polymers and Plastics, "Using an adhesion promoter is probably the most effective, most robust, and most versatile process but also the most expensive and environmentally unfriendly." Conventional adhesion promoters require copious amounts of hydrocarbon solvents. The solvent most often employed is toluene which is a VOC and a HAP and an extreme fire hazard.

The CSC approach takes advantage of the fact that the melt temperature of modified polyolefin resins, necessary for adhesion to TPO, is approximately 70°C which happens to be ideal for use in the powder coating manufacturing process. A stable mixture of modified polyolefin and co-resin is produced by compounding in a twin screw extruder at a temperature of about 100°C. Once cooled, the solid extrudate is micronized in an air classifier mill to produce a conventional powder coating having a particle size of about 30 microns. However, application of powder coatings by electro-static spray to non-conductive plastic substrates is not possible. CSC overcomes this challenge with the addition of water and subsequent wet-milling to further reduce the particle size and produce a stable colloidal suspension of powder coating particles in water. This "powder slurry" can be applied at 0.3 mils dry film thickness using the same spray equipment as traditional liquid coatings.

SURFACE ENHANCEMENTS

MONDAY AFTERNOON: 1:00 PM TO 3:15 PM

Approaches for Next Generation Adhesives for TPO Bonding

Arthur Cawley*, Thomas P. Clark,
DuPont – Mobility & Materials

The use of chemical primers in composite and thermoplastic bonding adds an additional complication to the manufacturing process and can contribute to VOC emissions. DuPont composite bonding adhesives are designed for bonding composites, plastics and dissimilar materials in a variety of light-weight applications including structural roof modules, liftgates, trunks, sunroofs, and composite panels. New formulations and strategies have been developed to generate durable bonding between TPO and a variety of substrates. The bonding chemistries and novel techniques associated with BETAFORCE™, BETAMATE™, and THIXON™ adhesives will be provided alongside a practical guide for TPO adhesion.

Surface Enhancements with UV-Curable Organic Coatings

Timo Lindenau,
Mankiewicz Coatings LLC

As we see more high gloss (piano) black finishes in automotive interiors, we also start to notice how easily some of these surfaces can be scratched or abraded - sometimes as a result of cleaning with something as mild as a paper towel. Fortunately UV cure coating technologies have been developed that can not only withstand this scratching, but also provide better chemical resistance than other coating types. Mankiewicz has supplied these coatings to global OEMs for over 10 years not only for these properties, but also for other benefits like the ability to reduce overall coating layers and / or thickness required to protect a part, minimizing scrap and lowering VOC emissions. In this presentation we will discuss the development and benefits of mono and dual-cure UV coating technologies and potential applications for polyolefin substrates.

Effect of Slip Additive on TPO Wear

Kwanghae Noh,
Texas A&M University

Fundamental understanding of the scratch, mar, abrasion, and wear behaviors of plastics is crucial for their maximized utilization in the design and production of light-weight automobile parts, especially for electric vehicles (EV). The growing demand for increasing EV mileage makes it necessary that more and more plastics components be utilized. As a result, these plastics parts will inevitably be subjected to increased scratch, mar, abrasion, and wear during operation of the EV. In this research, three different kinds of slip additives, i.e., erucamide, iso-stearamide and oleyl-palmitamide, were chosen to investigate how they affect the wear behavior of TPOs under both long-stroke reciprocating motion and fretting motion. Furthermore, the wear behavior of TPO against both steel and TPO counter-faces were studied. The fundamental structure-property relationship on TPO wear behavior is sought.

Case Studies with Silicone Masterbatch: Improvements in Flow, Mold Release and Coefficient of Friction

Mike McCormack*,
Dale Zevotek,
Emily Vrbensky,
SACO AEI Polymers

SACO AEI Polymers distributes specialty additives, including some unique silicone masterbatches that have been used to enhance flow and mold release and reduce the coefficient of friction in parts for better scratch & mar resistance. This paper will discuss these products and go over case studies where customers have been able to enhance performance or reduce costs of finished goods. It will be presented by a team that includes field technical development, research scientists and business development management. These products are available now with 3-day delivery, are FDA compliant and are cost efficient versus competitive products.

SURFACE ENHANCEMENTS & COATINGS

MONDAY AFTERNOON: 3:30 PM TO 5:30 PM

Enabling New Materials, Properties and Finishes with PPG's Ambient Reactive Extrusion (ARE) Additive Manufacturing Technology

Cindy Kutchko,
PPG Industries, Inc.

Additive manufacturing (AM) offers many advantages over traditional manufacturing methods, such as customization, improved design freedom, and lightweighting capabilities. PPG has developed an approach that enables additive manufacturing of large-scale, multi-material parts at ambient temperature (i.e. no external heating). Ambient Reactive Extrusion Additive Manufacturing encompasses two co-reactive liquid resins that when mixed and extruded, form a cured 3D object layer by layer. This ambient cure eliminates internal stresses, yields inter-layer covalent bonds, and scales efficiently. Capable of dispensing low and high viscosity liquids, functional fillers, rheology modifiers, and colourful pigments – this approach enables enhanced Z-strength, lightweighting, and improved aesthetics of end-use products. By fine-tuning the rheology, cure rate and deposition speed - parts can be printed with smooth or texturized surfaces (e.g. leather, wood-grain, synthetic), further reducing post-processing. Using this approach, we are able to consolidate parts and increase design freedom by covalently bonding multiple materials within a single part.

Comparison of Analytical Methods of Volatile Organic Compounds used in Vehicle Interior Materials

Rocco Rizzo*, Bixi Cha, Jeffery Fisher,
Applus Reliable Analysis

The objective of the study is to compare different test methods and data of Volatile Organic Compounds (VOCs) Emissions. Five test methods were applied on the same material. Total VOCs (TVOCs) calibrated to acetone is tested following head-space method under VDA 277, individual VOC compounds and TVOCs calibrated to toluene are assessed using thermal desorption analysis method under VDA 278, bag method under ISO 12219-2 and micro-scale chamber method under ISO 12219-3 (both bulk emission testing and surface emission testing).

New Standards: A Must for Labeling in the Plastics Industry

Jason Brownell,
Polyfuze Graphic Corporation

The definition of "Permanent" has been distorted. Its original meaning has been manipulated. We will challenge the claims of adhesive based decorating methods for Low Surface Energy (LSE) polyolefins including polyethylene and polypropylene. This presentation will bring to bring to light the risks of using warning labels sold as "permanent", when in fact the data shows otherwise. Data presented will include environmental and chemical testing for durability. The presentation will also illustrate to the participant, the history behind current testing methods, how out-dated those methods are, and why new standards are warranted to protect automotive OEM's and consumers from risk.

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A Greener Future on the Horizon

Trinseo is committed to helping automotive customers on their journey to meeting increasing environmental requirements and to supporting a circular economy. We not only develop materials with recycled content and bio-based ingredients but help our customers reach their sustainability goals by providing materials for eco-friendly material substitution or product design, e.g., lightweighting.

We know the importance of results and are committed to providing quantifiable data on environmental impact and eco-friendly advantage. Ask us about our flagship MAGNUM™ ABS, PULSE™ Engineering Resins, ENLITE™ Structural Polymers, ECO-grade resins, and what we have on the horizon to meet regulatory and sustainability challenges of tomorrow.

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INTERIOR APPLICATIONS & LAMINATING ADHESIVES

SESSION CO-CHAIRS:

Dr. Pravin Sitaram, Haartz Corporation; **Austin Wagenhals,** Ford Motor Co.; **Hoa Pham,** Freudenberg Performance Materials

MONDAY MORNING: 10:15 AM TO 12:00 PM

TPO and TPE Opportunities in Smart / Electric Vehicle Auto Interiors

Robert Eller,
Robert Eller Associates LLC

As in other market sectors, TPEs have grown in auto interiors via drop-in replacement of existing applications. The technology of the underlying auto interior market is shifting toward the ability to send and receive massive amounts of data as 5G systems proliferate and as mass electrification is introduced. These shifts will create new profitable opportunities for TPEs as part of send/receive data transmission devices that utilize smart TPEs with higher levels of functional values and as interior design shifts with mass electrification of vehicles.

Lightweight Low Force Tearing (LFT) TPO for Foam in Place Applications

J. Ryan Bailey,
Continental Surface Solutions

Continental Surface Solutions has developed and evaluated a new TPO based construction for foam in place part production. Xpreshn Ultralight LFT (Low Force Tearing) combines the lightweight features of a TPO foil/foam laminate construction with the processing capabilities of TPO compact sheet. Xpreshn Ultralight LFT offers reduced final part weight in comparison to the same part produced with Xpreshn; while allowing the current foam in place (FIP) production technology to be utilized. In addition to reduced part weight the product has positive evaluation as an option for development in Scoreless PAB applications.

Grain Retention Improvement and Measurement for TPO First Surfaces

Dr. John O'Gara*,
Brett Wreggelsworth,
Cameron Gibbins,
Inteva Products, LLC

The quality and appearance of the grained definition on thermoplastic surfaces of automotive interiors, including the instrument panel, door panels, and center console, are an integral part of the perceived overall quality of the vehicle. These grained structures can be formed during either in-grain negative forming or through the use of pre-grained sheet and positive forming. The resultant appearance will be dependent on part geometry, stretching, forming temperatures, and inherent material properties, such as extensional viscosity, strain hardening, tensile properties, and hardness. In this presentation, both negative and positive formed parts will be analyzed using a 3D optical microscope to characterize the depth of the grained pattern after forming and compared to a subjective visual assessment. In addition, the quality of the grain structure will be assessed for different sheet constructions, including bilaminate and compact sheet examples.

MONDAY AFTERNOON: 1:00 PM TO 3:15 PM

New Crosslinked Olefin Foam for Soft Touch Automotive Instrument Panels

Paul Sieradzki,
Toray Plastics (America), Inc.

A current and favorable technology to create soft touch automotive interior trim articles is through the use of bilaminates comprising a TPO foil bonded to a crosslinked polyolefin foam. These bilaminates are typically formed into various parts such as instrument panels, door panels, and other components. Vacuum forming is traditionally employed in the production of these components, but other processes can also be used including hand wrapping the bilaminate over a substrate. TPO/foam bilaminates offer advantages in terms of light-weighting, cost, environmental, and health & safety over other constructions and manufacturing methods. Current and future instrument panel and airbag designs

INTERIOR APPLICATIONS & LAMINATING ADHESIVES

have placed more stringent performance requirements on TPO/foam bilaminate constructions. A new ToraSoft® crosslinked olefin foam has been developed to significantly improve the airbag deployment, meeting the new requirements for automotive instrument panels. This new foam can be successfully used in the most demanding instrument panel applications including non-laser scored U, H, and bowtie configurations.

PP Foams for Ultra-lightweight Automotive Interior Applications

Kevin DeGrood,
Borealis Group

The automotive industry is constantly seeking for down gauging and weight saving opportunities to address the globally more and more demanding legislations on Green-House-Gas (GHG) emissions. Plastics, in particular polypropylene (PP) are a key enabler for light weight design in cars. The use of low density plastic materials not only results in lower component weights but also offers advantages in terms of design freedom, functional integration and of course manufacturing costs. Consequently, more and more components of a car's interior and exterior are made from plastics.

The development of alternative car concepts is increasing the need for new lightweight solutions, as weight reduction is directly proportional to range extension. The increasing use of polymeric foams and plastic foam structures is a logical next step. Apart from the obvious weight reduction, technologies like foam injection molding enable the production of parts with high dimensional stability (reduced warpage), minimized sink marks and complex geometries not possible with conventional injection molding techniques. At Borealis Polypropylene compounds were developed that can be processed into foamed automotive parts for structural but also visible applications offering excellent surface appearance and mechanical properties unlocking additional weight saving potential for future mobility solutions.

Synopsis

Plastics, in particular polypropylene (PP) are a key enabler for lightweight design in cars. The development of alternative car concepts is increasing the need for new lightweight solutions, as weight reduction is directly proportional to range extension. The increasing use of polymeric foams and plastic foam structures is a logical next step. At Borealis Polypropylene compounds were developed that can be processed into foamed automotive parts for structural but also visible applications offering excellent surface appearance and mechanical properties unlocking additional weight saving potential for future mobility solutions.

The Phenotypic Properties' Effect on the Foam's Level of Light Transmittance

Keigo Shimura*,
Sekisui Voltek, LLC
Kevin O'Malley,
Sekisui Voltek, LLC;
Rie Matsui,
Sekisui Chemical Co., LTD.

With the rising demand for more illuminated surfaces in the automotive interior, the development of light-transmissive foam and the properties that affect the level of light transmission through foam was studied. It was discovered that rather than the base polymer material, phenotypic properties of the foam had a more significant influence in the amount of light transmitted. In this paper, the development of Sekisui Voltek's light-transmissive crosslinked closed-cell polyolefin foam and the impact the phenotypic properties have on the light will be discussed.

Foamed PP Compounds for Aesthetic Automotive Interior Applications

Dr. L. Havermans*, J. Zhang, G. Kwakkenbos, R. Chu, A. Yanev, D. Bande,
SABIC

The automotive industry continues to face strong regulatory pressures to increase energy efficiency and decrease emissions. Weight reduction and low emission materials are key strategies – for automotive and material suppliers – to help achieve these goals. Lightweight materials present significant opportunities. In particular, the use of polypropylene compounds (PPc) – in combination with smart design – can make possible meaningful weight savings and additional value. Lightweighting via foam injection molding (FIM) has governed attention since the late 2000s as a solution for automotive parts. The combination of processing conditions and material formulations will result in FIM parts with different foam structures and surface quality. The presence of silver-streak or swirl-line surface defects significantly reduces the aesthetic quality of parts, limiting the application of FIM for direct use. In this paper, we present solutions that can enable excellent surface aesthetics and reduce emissions.

INTERIOR APPLICATIONS & LAMINATING ADHESIVES

MONDAY AFTERNOON: 1:00 PM TO 3:15 PM

Biobased Polyols for Automotive Application

Wolfgang Geuking*,
Nathan Noyes,
Erwin Honcoop,
Croda Inc.

Sustainability is moving beyond just a market demand, becoming, in the near future, a license to operate and produce. The presentation will cover two aspects of sustainability, viz. a) sustainability in the production of adhesives and b) the adhesive's impact on the environment during its use. The fate at the end of life of the adhesive is another important factor for consideration, for presentation at a later date. Equally important to sustainability is performance. Emphasis will be given to the adhesion to low energy substrates.

In the first part, we will be showing the extent to which making adhesives from renewable resources reduces carbon footprint, as demonstrated in a life cycle analysis. Using renewable energy resources in their manufacture further contributes to a reduction of this footprint.

In the second part, we will demonstrate how such adhesives enhance the adhesion to a variety of substrates used in modern products including automotive assemblies. In particular the bonding of low energy substrates such as TPOs, which are preferred in the automotive industry for their low cost and versatility among other factors, is a challenge for adhesives. The products presented here are specific biobased polyols, which, when used as building blocks in polyurethane adhesives, bring about better adhesive properties than more conventional polyols. Enhanced longevity of bonded articles is another contribution to sustainability, since reduced frequency to replace them reduces raw material consumption. This longevity is brought about by maintaining the initial bond strength over a longer period of time, through better resistance to chemicals and weathering.

The aforementioned ideas will be demonstrated with performance data obtained from application tests conducted with a range of polyurethane adhesives, whereby the polyol used in them contributes to the performance enhancements mentioned above. Additionally, industrial case studies will demonstrate their value in commercial uses.

Lightweight Thermoplastic Elastomers for Automotive Applications

Jaykm Battle,
Kraiburg TPE Corp.

Specific gravity of thermoplastic elastomers - especially vulcanizate and styrenic-based - ranges between 0.90 and 1.20. Weight of TPEs can be reduced by means of physical or chemical foaming processes. However mechanical and surface properties are dramatically affected. KRAIBURG-TPE partnered with 3M Company to develop a unique compounding process to manufacture styrenic-based TPEs with a specific gravity of 0.7 offering weight reduction of up to 50% in comparison to PVC, crosslinked rubbers, or other types of TPEs. This new line of lightweight TPEs also exhibit excellent UV stability, good compression set, extremely low shrinkage rate, and bond-ability to polyolefins and polyamides.

Styrenic Based TPE's with Superior Flow Properties for Automotive Interior Mats

Stephen Cranney,
Kraiburg TPE Corp.

An advantage of Styrenic based TPE's is good flow properties compared with other types of thermoplastic elastomers. KRAIBURG TPE has developed a high flow series designed for automotive interior mat applications that exhibit good mechanical properties and superior flow for improved filling of challenging part designs and improved surface appearance due to better copying of the mold grains and textures to produce premier parts. These new grades also have lower densities to offer part weight reduction.

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APPLICATIONS FOR BIOBASED MATERIALS

SESSION CO-CHAIRS:

Dr. Alper Kiziltas, Ford Motor Co.; **Akshay Trivedi,** General Motors Co.; **Drew Geda,** Hyundai Motor Group

TUESDAY AFTERNOON: 1:00 PM TO 3:15 PM

A Study on Fiber Length Distribution of Glass Fibers in Injection Molded Polypropylene Composite

Dr. Sandeep Tamrakar,
Ford Motor Co.

Fiber breakage of long and short glass fibers were investigated in injection molded composites with polypropylene (PP) matrix. This study mainly focuses on the fiber breakage from mechanical recycling via grinding, and as the polymer melt flows through narrow and sharp corners during injection molding. Five rounds of mechanical recycling led to a 43.5% and 27.9% decrease in tensile strength and modulus, respectively of long glass fiber PP composites. Significant reduction in the average fiber length was observed, which decreased from 706 µm to 304 µm. Similarly, injection molding through tortuous path also showed reduction in average fiber length. Cox's model shows a decrease of up to 7% in tensile modulus after the polymer melt passes through narrow sections and 90° bends. Whereas, Kelly Tyson model shows a decrement of up to 13% in tensile strength for polymer melt that has passed through the same tortuous path..

Blue Agave Fiber – A Lightweight and Renewable Filler for Polymer Composites

Amy Langhorst,
Ford Motor Co.

Blue agave bagasse fiber is a byproduct of the tequila production process, which results in the disposal of over 940 thousand tons of agave fiber each year. Environmental and logistical challenges with the large volume of waste fiber has driven recent interest in the use of blue-agave fiber as a filler or reinforcing agent in polymeric materials. As the automotive industry strives to reduce vehicle carbon footprint, lightweight renewable fillers will play a key role in replacement of heavier synthetic reinforcing agents. This work investigates the use of blue-agave fiber as a lightweight, sustainable talc replacement in TPOs for visible interior applications.

Viscoelastic Properties of Basalt-Hemp Hybrid Reinforced Polypropylene

Kyleigh Rhodes,
Washington State Universtiy

Composites have been used in the automotive industry for decades improving the performance and overall weight of vehicles. In recent years, natural and renewable fibers have been gaining interest from car manufactures due to their low cost and density, as well as ecofriendly nature. In order to be fully incorporated into industry settings, the melt and viscoelastic behaviors are critical to understand. Rotational and capillary rheology are used to determine properties such as viscosity, storage modulus and loss modulus at various shear rates. The data collected identifies how the alternative materials compare to traditionally used glass fiber composites in industry and if they are viable options for the future.

Hybrid Reinforced Composites Based on Polysaccharide and LFG

Christian Lenges
International Flavors & Fragrances

Innovation in the automotive industry increasingly focuses on strategies directed towards meeting ambitious environmental and sustainability targets. A key component of this strategy is the focus on the overall light-weighing of materials of construction. Hybrid composites were developed combining a reinforcing semi-crystalline engineered polysaccharide (alpha symbol-1,3-glucan) in combination with typical glass fiber in a polypropylene matrix to optimize the overall performance to enable automotive manufacturing while also considering environmental attributes. Morphological analyses were conducted in conjunction with the evaluation of mechanical performance of these hybrid composites to gain further understanding of filler-matrix interaction and its overall impact on the performance properties of the composites. Optimum loadings of the polysaccharide / glass fiber system were identified as promising alternative to the current typical glass fiber / polypropylene incumbent material utilized in a typical commercial application (e.g. by Ford Motor

APPLICATIONS FOR BIOBASED MATERIALS

Company for body interior and under-the-hood applications). Selected formulations showed an overall increase of >100% with respect to modulus, strength and impact properties while also demonstrating a density reduction of up to 15%. Therefore, hybrid reinforced thermoplastic composites offer a balance of engineering and environmental performance to exceed materials in use. These new composites are commercially viable while also advancing the environmental stewardship and eco-efficiency within the automotive industry.

TUESDAY AFTERNOON: 3:30 PM TO 5:30 PM

VOC Analysis of Various PP Fiber Reinforced Composirtes Designed for Autmotive Interiors

Kyleigh Rhodes,
Washington State Universtiy

In recent years it has been found that the "new car smell" is linked to various chemicals that off-gas from materials in the first few months after manufacturing. Not all chemicals released are toxic, however, volatile organic compounds (VOCs) have been found in the mix, which are known to cause adverse health effects. Standards have since been established by automotive manufacturers to create a safer indoor air environment for consumers. Several polypropylene composites reinforced with different fibers (basalt, hemp, and glass) have been analyzed through gas chromatography-mass spectrometry at various temperatures, with and without UV radiation, to determine compounds being emitted and the rates at which they are emitted. Understanding the off gassing of different materials within a vehicle will help ensure a safe environment is created for future drivers and passengers.

Hemp Fiber Filled Composites

Greg Dean,
The Hemp Plastic Company

The focus of this paper is on discussing and comparing hemp filled resins with other traditional virgin and or filled resins. Those resins would include glass and mineral filled polypropylene. The comparatives include: structural performance, injection performance; and life cycle analysis of the materials, with a focus on carbon footprint differentials within the various materials.

Conducting the Change Using Thermoplastics Filled with Hemp Fibers in Automotive Industry

Jean-Marie Bourgeois-Jacquet,
Automotive Performance Materials

High performances Bio composites using hemp fibres is now a reality. In the automotive environment, this type of material is used for more than 5 years with proven benefits on weight reduction. The presentation will present the conditions of success for such a material, how hemp is a key element of the complete value chain and the perspectives with new coming generations – including combination of hemp fibres with recycled matrices, for automotive plastics but also in other industries.

SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE

SESSION CO-CHAIRS:
Mike Balow, Auxin Consulting, LLC; **Susan Kozora,** IAC Group; **Mark Allen,** Dow

TUESDAY MORNING: 10:15 AM TO 12:00 PM

The Great Plastics Distraction: How "Environmental Groups'" Obsession with Plastic Has Actually Harmed the Environment

Chris DeArmitt,
Phantom Plastics

This talk will summarize what we know about plastics and the environment and will go on to present shocking new evidence that explains how we became so misled and who is responsible. Right now, well-meaning people are harming the environment based on misinformation. If you care, then please see this talk so you can be sure to take actions that help, rather than harm, the environment.

Pursuit of Sustainability Through Lifecycle Thinking

Rich Helling,
Dow

Decisions about the production or purchase of products has been driven by price and performance. Sustainability concerns are new drivers, representing our aspirations for the future and issues that are poorly described by economics today. Many concerns can be quantified with using the concepts of life cycle thinking and life cycle assessment (LCA), such as product carbon footprints. This talk will describe these and give examples of using them to see challenges, trade-offs and ways to pursue sustainability.

Plastics and Sustainability in 2021

Patrick Krieger,
Plastics Industry Association

Economic and policy trends of recent years are motivating companies in the plastics industry to adapt and focus on the sustainable aspects of their products – either by emphasizing those that currently exist or by working to create new ones. Recent advancements in sustainable plastics manufacturing, mechanical and advanced recycling, are helping companies compete in markets that prioritize sustainability. In addition to providing insights on the current market conditions and of plastics recycling and the plastics policy landscape, this presentation will cover how the industry is working to solve the challenges that exist with new technology investments and the development of new end markets for a variety of materials.

TUESDAY AFTERNOON: 1:00 PM TO 3:15 PM

Challenges and Opportunities for Polyolefins within an Emerging Circular Economy

Geoffrey Inch,
Braskem

In a truly circular economy, nothing is wasted and everything is transformed. To get there, the current plastics recycling infrastructure must be improved through broad industry collaboration and innovative new approaches. Braskem, already a N.A. leader in polypropylene and global leader bio-based polyethylene, is committed to advancing the industry's ability to collect, reprocess and incorporate recycled polyolefin materials effectively. This paper will explore the challenges within our current recycling systems and the opportunities to develop more sustainable polyolefin solutions for various applications, including automotive.

The Role of Plastic Additives in Improving the Properties and Durability of Recycled Automotive Plastics

Nancy Cliff,
BASF

One of the challenges in plastic recycling is the likelihood that the polymer has already undergone thermal and/or photo-oxidative degradation, leading to inferior properties relative to the virgin material. Even a small fraction of degraded material can have an adverse effect on the entire part. We will show that it is possible to improve the initial and longterm properties of the recycled material through the use of additive packages that compensate for the depletion of the original stabilizers, and provide other benefits such as improved rheology in polypropylene.

SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE

Circular Economy Solutions: Borealis Strategy, Infrastructure for PCR and PIR Supply, Product Examples

Andrew Sanders,
Borealis

At Borealis, Circular Economy Solutions for the plastics industry means taking an integrated approach to the problem of preventing waste while maintaining an economically viable value chain that delivers products that can compete with virgin materials. With that approach in mind Borealis has become a major player in CES solutions with its acquisitions of PP recycling infrastructure, chemical recycling and the "plastics-to-oil" initiative. In this paper we will focus on the PP recycling infrastructure efforts, and how to achieve clean, reliable, economical, and consistent PCR and PIR feedstocks for PP compounds that can compete with virgin materials, as well as case studies of PP compounds made using them.

Advanced Additive Technologies for Upcycling

John Mara*, Jenji Yamashita,
Adeka

As a measure to help realize a circular economy, plastic recycling has become increasingly important, and various approaches from mechanical and chemical recycling to energy recovery are taking place. The percentage of recycled plastics going into automotive materials is increasing, however, the physical properties of these recycled materials must still be comparable to virgin materials. In this paper, we will demonstrate that new additive innovations from ADEKA can markedly improve thermal stability and mechanical properties of PP recyclate, thereby expanding the end use applications of recycled resins.

TUESDAY AFTERNOON: 3:30 PM TO 5:30 PM

A Recycled Content Material Solution for TPV Applications

Edgar Gonzalez,
Synesis LLC & LyondellBasell

The environmental and health problems associated with scrap tires and discarded rubber items are well known. For these reasons, methods have long been sought to utilize waste thermoset rubber products in technical applications of the highest possible quality. This presentation describes an airless tire application where a recycled rubber based thermoplastic elastomer, ECO-FLEX RTPV, has replaced virgin SBR thermoset rubber. It will include a discussion on performance properties required vs. performance achieved and cost benefits.

Incorporating Micronized Rubber Powder into Composites to Increase Sustainability in Automotive Applications

Annabel Sharnowski,
University of Michigan

The main focus of this study was to integrate Micronized Rubber Powder (MRP) made from post-manufacturing shoe rubber into composites as a potential replacement for long glass fiber. Multiple composite hybrids were created containing varying amounts of MRP, long glass fiber, and recycled polypropylene. The composites underwent flexure, tensile, and impact testing to discover the effects of the MRP on their mechanical properties. The goal was to create an eco-friendly, lighter-weight, and sustainable alternative for composites used in automobiles.

Addressing Viability of Collecting and Recycling Automotive Plastics

Andy Brewer,
Plastics Industry Association

The average lifespan of a vehicle is estimated to be about 11 years, and increasingly those vehicles are comprised of more plastics. With approximately 12-15 million vehicles scrapped each year in the U.S., it is important to explore new ways to recover the plastics components at a vehicle's end of life for recycling. PLASTICS launched the New End Market Opportunities (NEMO) program for end-of-life vehicles to evaluate the feasibility of collecting and recycling automotive plastics, focusing first on thermoplastic polyolefin (TPO) bumper fascia. This presentation will discuss the different phases of the program, material collection, processing, evaluation, and the economic variables to be considered.

SUSTAINABILITY, REUSE, RECOVERY, AND RECYCLE

WEDNESDAY MORNING: 9:30 AM TO 1:15 PM

Enabling Sustainability through Postconsumer Recycle Content in TPO

Robert Mimms,
Advanced Composites, Inc.

Automotive OEMs and tier suppliers are setting goals for increased utilization of sustainable materials. Advanced Composites has developed a line of TPO Compounds with post-consumer recycle (PCR) content to support customers in achieving those goals. The compounds developed have drop-in performance to existing automotive TPO products with varying levels of PCR content based on application requirements. This presentation will introduce these materials as well as describe the challenges associated with the inclusion of recycle content into TPO formulations.

Automotive Shredder Waste: A Marketing Challenge

Jeff Spangenberger,
Argonne National Laboratory

Auto shredder residue is a great source of durable plastics. The most abundant of these is polypropylene. Argonne National Laboratory has developed technologies to recover polypropylene from auto shredder residue, but challenges remain. This presentation will provide the history of Argonne National Laboratory's work in the recovery of polypropylene and other materials from auto shredder residue and the plan to address the remaining challenges so that the recycling of these materials can finally be realize.

CirKular+ Solutions for Plastics Recycling

Amit Desai, Kraton

CirKular+™ products were developed to address the challenges with reusability of plastics parts, and increasing the usage of PCR. CirKular+ products can significantly improve the impact strength of PCR PP and PCR HDPE without compromising other physical properties such as stiffness and tensile strength. In case of mixed PCR streams, these products compatibilize typically incompatible streams such as nylon and PP, or HDPE and PET and improves the impact strength or ductility of these streams.

Inteather™ Material Solutions for a Sustainable Future

Kevin Lyons,
Inteva Products LLC

Sustainability is an important topic across all industries because of its focus on minimizing the negative environmental and societal effects throughout the life-cycle of a product. Within the automotive industry, TPO polymers have a marked advantage over alternatives when considering the entire value-stream. Additionally, with TPO-based products, the implementation of a recycling strategy is possible and results in several benefits. Inteva Products, LLC has a long history of supporting TPO technologies and products due to this clear advantage in supporting sustainability. This presentation will discuss what it truly means for a product to be "sustainable" and briefly introduce the Inteather™ products and on-going developments from the perspective of supporting this goal.

Summary and Reflections Regarding Sustainability, Reuse, Recovery, and Recycling Session

Mile Balow*, Auxin Consulting, LLC
Mark Allen, Dow
Susan Kozora, IAC Group

Today significant amounts of polypropylene are being recycled and used in several automotive parts, all meeting the customers specification. Most of the recycled polypropylene is coming mainly from non-automotive sources such as woven and non-woven fibers, food packaging, carpet, batteries, and more recently medical garment waste.

Efforts to reclaim larger automotive parts such as bumper fascia, interior trim and instrument panels are difficult because they are often complex parts that include other polymers, paint, and metal. Material from those sources are starting to be used primarily for non-automotive applications.

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INNOVATIONS IN PLASTICS FOR FUTURE MOBILITY

SESSION CO-CHAIRS:
David Helmer, General Motors Co.; **Andrew Sanders,** Borealis Compounds

TUESDAY MORNING: 10:15 AM TO 12:00 PM

Future Mobility Trends Affecting TPO Applications

Dave Helmer, General Motors Co.

Thermoplastic polyolefin materials such as polyethylene and polypropylene have become the most widely used material by mass in automotive. Over the years, the thermoplastic polyolefin trend has been to replace engineering plastics as well as metals more and more due to cost, mass, and property improvements becoming the most widely used polymer by mass. As the pace of change accelerates, automotive trends will be presented that effect thermoplastic polyolefin future usage.

Battery Pack Optimization with Polypropylene Materials for Next-Gen Electric Vehicles

Dave Sullivan*, John Waters, SABIC

Today, conventional metals serve as the incumbent materials for the construction of electric vehicle (EV) battery pack applications such as enclosures, module boxes and other structural components. With the industry accelerating its shift to EVs, OEMs and their suppliers are striving to optimize the design of these systems for weight savings, flexible design, enhanced performance, greater safety and improved economics. This session will consider the challenges involved in EV battery pack design and optimization and, specifically, the potential of both long- and short-glass fiber polypropylene resins to help address them and achieve the above objectives.

Radar Transparency of Thermoplastic Olefins (TPOs) for Bumper Fascia

Jane Lu*, Charlie Yang, LyondellBasell

The use of long-range radar (LRR) sensors is becoming more common to enable vehicle safety and comfort features, especially for autonomous driving. As these sensors are typically integrated behind the vehicle's bumpers, it is therefore critical to understand what affects radar transparency of the bumper fascia. A thorough investigation was conducted to characterize interaction of thermoplastic olefins TPOs (the typical materials used for bumper fascia components) with the radar wave at high frequency range (76-77 GHz). The study covered the effects of the TPO composition, the paint system and the part thickness on radar reflection and transmission. The work is intended to address OEM concerns in designing a bumper fascia with radar transparency since there is little prior experience or knowledge in this area today.

TUESDAY AFTERNOON: 1:00 PM TO 3:15 PM

Boron Nitride Enabled Cable Insulation Material

Md Golam Rasul, University of Illinois

Thermoplastic polyolefin materials such as polyethylene are in great demands for dielectrics and electronic devices due to their low permittivity and high electrical breakdown strength [1].

However, low mechanical and thermal properties pose major challenges towards long term application [2]. As such, poor thermal management creates hot spot during long term electrical operation. Polyolefin nanocomposites are being developed to improve the mechanical and thermal properties which can contribute to the safety and performances of insulation materials and electronic devices for long term stability. Highly researched 2D nanomaterials such as graphene have been used for polymer based nanocomposites [3] and these nanocomposites exhibit enhanced mechanical and thermal properties, however, these also increase electrical conductivity which are detrimental for dielectric material application.

Versatile Halogen-free flame-Retardant Polypropylene Composites for Lightweight Electric Car Applications

Florian Schuetz, Borealis

Components for electric cars have been moving from metal to plastic for enabling lightweight construction, better environmental footprint and cost reduction. With the Borealis halogen-free polypropylene compositions, we go one step further by combining flame retardancy and dimensional stability with processability, and excellent mechanical properties. Borealis newly developed compounds can be used for example in lithium-ion battery applications such as cell holders and thereby provide a more sustainable and cost-effective alternative to existing plastic solutions.

INNOVATIONS IN PLASTICS FOR FUTURE MOBILITY

3D Printing with Polypropylene- from Prototypes to Production Parts

Dustin Kloempken, HP, Inc

Join this webinar to learn more about HP's polypropylene (PP) material enabled by BASF, and how Extol has leveraged HP's Multi Jet Fusion 3D printing technology and new PP material to help their customers decrease time to market through design validation efficiency.

Key takeaways:

- Learn how to accelerate your product development process using the same prototyping material as the final part
- Discover how Extol has leveraged HP Multi Jet Fusion technology and PP material
- Explore examples of new applications made available with PP

Weight Reduction of Plastic Components with the Latest Technology

Trevor Pruden,
Arburg

With focus on increased cost of energy there is excellent opportunities to increase energy efficiency through weight reduction of IM components ('Light weighting' of parts while maintaining or improving, their performance in their application fields). Using Fiber Direct Compounding as a new Technology will allow for the Fiber added during injection molding instead of during compounding. The result is usually a mechanically stronger part with lower Glass content needed that reduce the overall part weight.

LIGHTWEIGHTING OF POLYOLEFIN PARTS

SESSION CO-CHAIRS:

Mike Shoemaker, Borealis Compounds; **Normand Miron,** Washington Penn Plastic Co., Inc.;
Dr. Nadeem Bokhari, Sumika Polymers NA

TUESDAY AFTERNOON: 1:00 PM TO 3:15 PM

THERMOFIL HP®-High Performance Light-Weighting Polyolefins Pushing the Boundaries Using the Latest Development in CAE for Accelerating Part Development and Innovation

Nicolas Schlutig,
Sumika Polymer Compounds France
Hideaki Nishio,
Sumika Polymers North America

Cost saving through light weight solutions is predominate in increasing polypropylene compounds demand in the automotive industry. Innovative product development in high performance glass coupled PP compounds has driven the substitution of engineering thermoplastics like polyamide compounds in mechanical and structural automotive parts contributing to weight saving and CO2 reduction targets. Environmental concern is also driving the latest development in automotive industry and obliges to rethinking the way to design a car.

SUMIKA Europe will present a new family of engineering PP, THERMOFIL HP® range meets this development challenges, showing innovative and creative performances in polypropylene short glass fibres compounds combined with full innovative material card including glass fibres orientation, some behaviour under different solicitations like static, dynamic, creep and fatigue up to 135°C to support CAE and easiest "redesigning" with the aim of developing lightweight solutions for sustainability. Sumika Europe will be showing a case history comparing prediction and real behaviour on different parts subject to cyclic creep loading like plastics integrated windows rails, etc.

Carbon Fiber for Lightweighting

Mark Evans,
Borealis NV

With the significant growth of carbon fibres, the challenges in the use of this material, in particular around resource intensive production and disposal, are becoming more prominent; classical disposal is not an option from financial, environmental and technical perspective.

Borealis assumed this challenge and created the new Polypropylene material generation reinforced with recycled carbon fibre, addressing the challenges of tomorrow, and creating additional weight saving and down gauging opportunities for Automotive parts. Several technical and commercial case studies, illustrating the variety of possibilities offered with this new generation of materials will be discussed in the presentation.

Lightweight Solutions for Automotive Applications

Charlie Yang,
Lyondellbasell

To help address part weight reduction for automotive industry, this presentation covers several key approaches including chemically or physically foamed injection molding, thin walled parts design, lower density materials offering with innovative technologies, and any combination of these methods.

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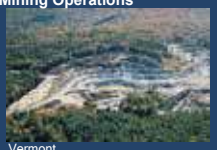
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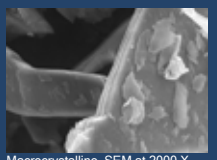
Quality Talc Morphologies from Magris Talc


Microcrystalline, SEM at 2000 X


Macrocrystalline, SEM at 2000 X


Macrocrystalline, SEM at 2000 X

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PROCESS DEVELOPMENTS

SESSION CO-CHAIRS:
Matt Sprouse, Washington Penn Plastic Co., Inc.; **Dr. Suresh Shah**

WEDNESDAY: 10:15 AM TO 1:05 PM

Quantum Leap in Polymer Process Development with SmartChronos Artificial Intelligence

Dr. Arash Kiani,
Alterra Holdings

AI is the key in analyzing, solving and implementing complex polymer process problems on the fly in the factory floor. SmartChronos developed by Alterra team is the tool that makes this a reality. Process engineers globally can utilize SmartChronos to continually increase production up-time. Machine learning process is at the heart of the SmartChronos which brings this digital transformation into your manufacturing operation. A very important but hidden revenue increase opportunity.

Disruptive Innovation – Digital Polyporopylene – 3D Printing

David Tucker,
Forecast 3D

With the introduction of PP material for the Multi Jet Fusion (MJF) 3d Printing Platform by HP. Engineers looking for digital options to manufacturing parts in PP are now possible. Hear from HP and Forecast 3D on how the capabilities of this new material, enable a first ever product offering of Digital Polypropylene using MJF opens a multitude of innovation opportunities for several industries, especially automotive. This presentation will cover the topic of disruptive innovation, the benefits of digital polypropylene, and how you can transform your business with digital offering.

How and When to Inject Super Critical Fluids into a Twin-screw extruder to Improve TPE/TPO Compounding Processes and Products

Charlie Martin,
Leistritz Extrusion Company

How and When to Inject Super Critical Fluids into a Twin-screw extruder to Improve TPE/TPO Compounding Processes and Products

TPO Compounding 2030: Past, Present Future of Twin Screw Extrusion

Cameron Kheradi,
Coperion Corporation

TPO Compounding 2030: Past, Present Future of Twin Screw Extrusion

3 D Additive Manufacturing

Trevor Pruden,
Arburg

Rapid Prototyped parts through freeforming capabilities with exactly the material that the part will be produced in mass production. How it works with Single, and Multi Component Technology. Application examples as Prototype pars as well as small production part. Further the new development by using 3 different materials allowing for 3 K parts or 2 K parts plus one as support material.

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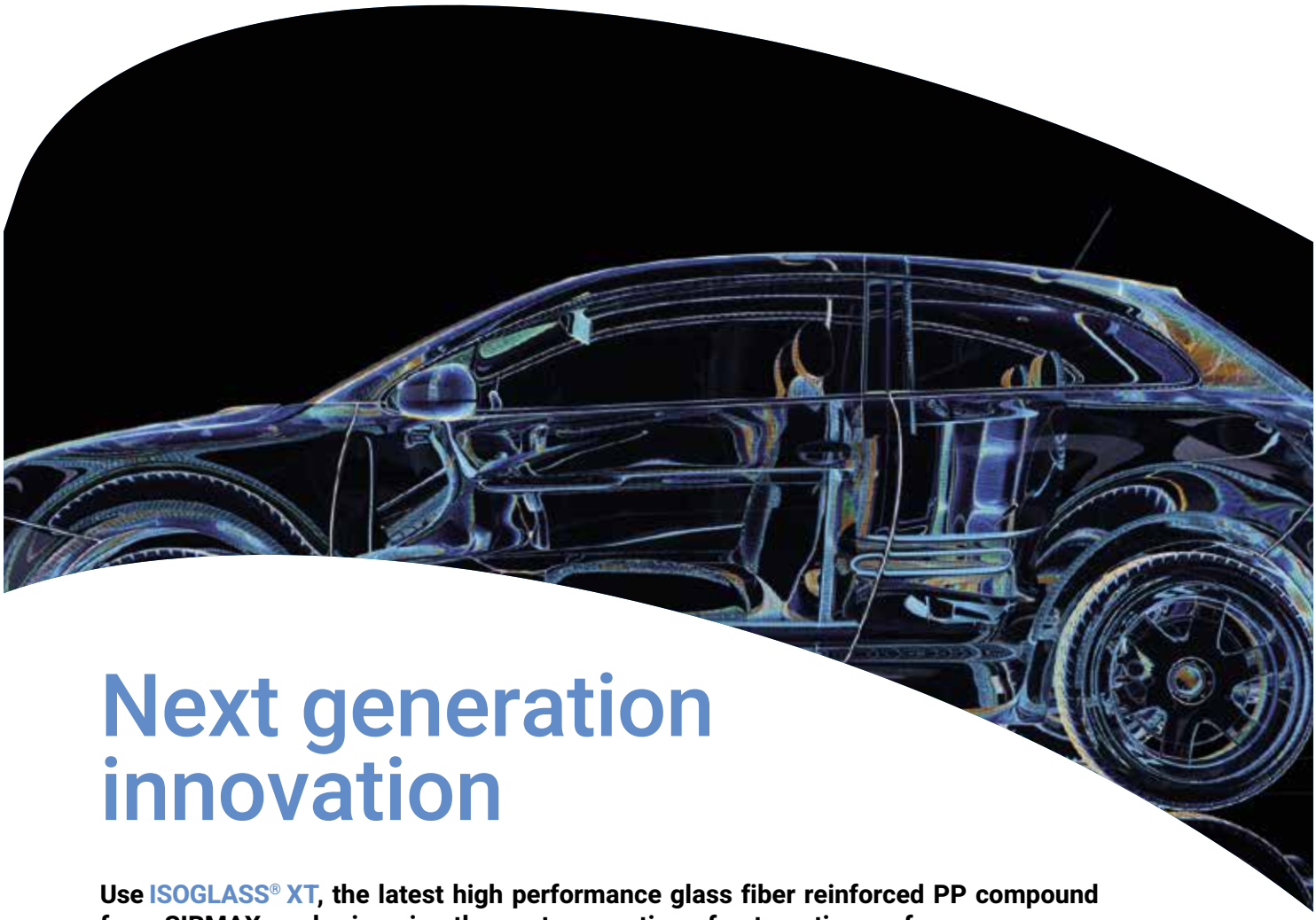

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