TPO AUTOMOTIVE ENGINEERED POLYOLEFINS CONFERENCE®

DETROIT

October 1-3, 2012

14th Annual

1998–2012

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The World's Leading Automotive Polyolefins Forum

Since 1998, the Detroit Section of the Society of Plastics Engineers (SPE®) International has organized the *SPE TPO Automotive Engineered Polyolefins Conference* to showcase the latest developments in TPEs, TPVs and rigid and flexible TPOs. The show is the world's leading automotive polyolefins forum featuring 50+ technical presentations, panel discussions, keynote speakers, networking receptions and exhibits that highlight advances in polyolefin materials, processes and applications technologies.

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Few conferences of any size can provide this scope of networking opportunity, with an engaged, global audience of over 500 attendees, typically, from 20 countries on four continents. A third of conference attendees work for a transportation OEM and roughly 20% work for a tier integrator.

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ExxonMobil Chemical

14TH-ANNUAL SPE® DETROIT TPO AUTOMOTIVE ENGINEERED POLYOLEFINS CONFERENCE®

Welcome to the 2012 SPE Global TPO Conference

Since 1998, the SPE TPO Automotive Engineered Polyolefins Conference has highlighted the importance of rigid and flexible polyolefins throughout the automobile – in applications ranging from semi-structural composite underbody shields and front-end modules to soft-touch interior skins and bumper fascia. Engineered polyolefins have been the fastest-growing segment of the global plastics industry for more than a decade owing to their excellent cost/performance ratio. The conference typically draws approximately 500 attendees from 20 countries on four continents who are interested in the unique opportunity to network with the major OEM and Tier suppliers and learn more about the latest in rigid and elastomeric TPO as well as TPE and TPV technologies. Fully a third of conference attendees say they work for a transportation OEM, and roughly 20% work for a tier integrator/molder, with the balance from materials or reinforcement suppliers, equipment OEMs, industry consultants, and members of academia.

The Society of Plastic Engineers (Detroit Section), leading OEMs, Tier, resin and equipment suppliers have dedicated their resources to create this the 14th Annual SPE Automotive TPO Global Conference. The conference is a dynamic, interactive, and cost-effective learning experience "put together" and "contributed to" by the world's foremost authorities on materials, processes, applications, and market trends.

The mission of SPE International is to promote scientific and engineering knowledge relating to plastics worldwide and to educate industry, academia, and the public about these advances. SPE's Detroit Section is active in educating, promoting, recognizing, and communicating technical accomplishments for all phases of plastics and plastic based-composite developments – particularly in the automotive industry.

This year's program has been increased to feature 9 technical sessions with over 60 presentations. A wide range of industry topics will be covered including Soft to Rigid Polyolefin Product and Application Developments, Surface Enhancements, Part Design, Tooling and Processing, Lightweight TPO Structural Applications, Understanding TPO's and Large Part TPO Thermoforming. Presenters will highlight the latest developments and solutions to current and future industry challenges.

Additionally, there are five keynote speakers: Vincent Yuskiewicz, Energy Advisor – Exxon Mobil Corporation; Patrick Stewart, VP and Executive Director of Interior Systems – Inteva Products; Lisa Whalen, VP, Growth Consulting Automotive & Transportation – Frost & Sullivan; Howard Rappaport, Senior Director Global Plastics – IHS Chemical; Alexander Buechler, Owner and Publisher - HB Media. Their talks will be timely, informative, enlightening and entertaining.

Thank you for attending this year's conference, we invite all attendees to visit our exhibitors and enjoy one on one dialog with the presenters, exhibitors and your industry colleagues. We appreciate your comments and feedback as we continue to strive to meet your needs.

Bill Windscheif
Co-Chairman
Advanced Innovative Solutions, Ltd.
President
Market Developer

Jeff Valentage
Co-Chairman
ExxonMobil Chemical Company
Specialty Elastomer Business

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Venue/Exhibits

Sassan Tarahomi *International Automotive Components*
Sanjay Patel *Flint Hills Resources*
Kelly Beauchamp *DME*

Monday, October 1

7:30	Registration – Continental Breakfast Sponsored by CIMBAR	
8:30	Welcome Remarks: Bill Windscheif, Conference Co-Chair	
8:45	**Vincent Yuskiewicz:** Energy Advisor Corporate Stragtegic Planning, ExxonMobil Corporation "The Outlook for Energy: A View to 2040"	
9:15- 9:45	**Patrick Stewart:** Vice-president and Executive Director, Inteva Products, LLC "Innovative Concepts for Automotive Interiors"	
9:45 - 10:00	Technical Program: Norm Kakarala, Pete Grelle	
10:00 - 10:30	Exhibitor Break	
	Salon A-C	Salon D-F
	Automotive Interior Trim & Skin Session Chairs: Robert Eller & Yvonne Bankowski	Rigid Polyolefin Compounds Session Chairs: Michael Balow & Ermanno Ruccolo
10:30 - 11:00	New Sustainable Surface Materials Concepts for Automotive Interiors Dr. Juergen Buehring, Benecke-Kaliko AG	The Effects of Types of Coupling Agent and Fiber Glass Type on the Mechanical Properties of PP LFT Materials Creig Bowland, Jaap Van der Woude, PPG Industries Inc.
11:00 - 11:30	New HSBC Slush Molding Technology for Soft Skin Applications Troy Wiegand, Kraton Polymers	Novel Organic Long Glass Fiber Filled TPO Materials for Solid and Foamed Interior Parts Motoko Ito, Japan Polypropylene
11:30 - 12:00	Advances in TPOs for Soft Automotive Interior Trim Pravin Sitaram, Mark Helder, Haartz	A Low Moisture, Wood, Cellulose Flour Composite Pellet with Improved Performance and Cost Structure for Material Replacement and Share Shift Applications Robert Joyce, Innovative Plastics & Molding
12:00 - 1:00	Lunch Sponsored by Trinity Resources	
1:00 - 1:30	Meeting the Cosmetic Challenges for Interior Automotive Applications using Novel TPO Compound Designs Joan Glogovsky, LyondellBasell	Weight Saving Materials for Instrument Panels Jeff Webb, Ford Motor Company
1:30 - 2:00	Applications of TPOs/TPEs in the Indian Automotive Market – Challenges & Opportunities for Global Suppliers Mirisch Damani and Aschak Damani, Zylog Plastalloys	Challenges & Comparison Between the Emission Reducing Strategies and Technical Requirements for Materials, Parts, and Complete Vehicles by Car Manufacturers Over the World H.P. Schlegelmilch, M. Eickeler, M. Holzwarth, et al, imat-uve Group GmbH
2:00 - 2:30	New TPV for Automotive Applications (ESPOLEX-6000) Series Shuhei Ono, Sumitomo Chemical	Recent Advances in Low Carbon Emissions and Odor PP Compounds Vaibhav Apte, Asahi Kasei
2:30 - 3:00	Dolphin Soft Touch Core Back Process Vittorio Bortolon, So.F.TeR. S.p.A.	Volatile Organic Compounds in Automotive Interior Applications Mark Chahl, ExxonMobil Chemical Company
3:00-3:15	Break Sponsored by International Automotive Components (IAC)	
	Automotive TPEs Session Chairs: Robert Eller & Jeff Valentage	Part Design, Tooling and Processing Session Chairs: David Okonski & Chuck Buehler
3:15 - 3:45	PLENARY SPEAKER TPEs: Positioning for Success in the Global Automotive Sector Robert Eller, Robert Eller Associates LLC	PLENARY SPEAKER Polyolefin Properties versus Simulation Accuracy David Okonski, GM R&D Center
3:45 - 4:15	Why TPE-S Forms the Best TPE Alternative to EPDM Replacement for Automotive Glazing Systems Jason Clock, Benoit Burel, CTS	Tiger Stripe Simulation: the Next Level in Prediction & Material Development Tobias Allmendinger, Borealis Compounds
4:15 - 4:45	Overview of EPDM/TPE Hybrid Systems Sebastian Roux, SaarGummi	How to Reduce Molding Defects in TPO Molding with Moldflow 3D Venting Simulation Don Kosheba, Asahi Kasei
4:45 - 5:15	Understanding the Friction Effects of Polyamide (PA) and Polyester (PE) Flocked Contact Area on a Car Door Seal in Respect to Squeak and Itch Noise Mahmoud Oumohand, R. Santoni, Cooper Standard	Moldflow Simulation for Thin Wall TPO Interior Components to Reduce the Molding Defects Jeff Webb, Li Qi, Ford Motor Company
5:15	Networking Reception Sponsored by ExxonMobil Corporation	

Tuesday, October 2

8:00	Breakfast		
8:30	Introduction of Keynote Speaker: Jeff Valentage, Conference Co-Chair		
8:45	**Lisa Whalen:** Vice President Growth Consulting and Automotive Transportation, Frost & Sullivan North America "Throwing Light On the Future: Mega Trends and their Ability to Shape Personal Mobility"		
9:15	**Howard Rappaport:** Senior Direct Global Plastics, IHS Chemical "Global Polyolefins Overview"		
9:45	Exhibitor Break		
	Salon A-C	Salon D-F	Dennison
	Automotive TPEs Session Chairs: Robert Eller & Jeff Valentage	Part Design, Tooling and Processing Session Chairs: David Okonski & Chuck Buehler	Surface Enhancements Session Chairs: Dr. Rose Ryntz & Dr. Laura Shereda
10:00 - 10:30	Innovative Weatherseal Attachment Solutions Jim Schoonover, Vintech Industries	Injection Molding Quality Control through Multivariate Analysis David Calder, Polycon Industries	Understanding Scratch & Mar-Induced Deformation Mechanisms in Polymers Using Finite Element Method M. Hossain, Dr. H. Sue, Texas A&M University
10:30 - 11:00	Applying TPV Seals to Improve Sunroof Sealing Performance John McGovern, JYCO Sealing Technologies	Novel Methods and Surface Activation Qualification for Flaming Parting Line Flash Stephen Putnam, J. Moore ,T. Glogovsky, Polycon/ LyondellBasell	Quantitative Machine Vision Assessment of Mar Visibility of TPO Surfaces Allan Moyse, Noah Smith, M. Hossain, Dr. H. Sue, Texas A&M University
11:00 - 11:30	Dynasol Proposes Innovative Solutions for Thermoplastic Elastomers (TPEs) Mariano Ramirez, Dynasol Elastomers	Open Compound Concept for Automotive Applications Ralph Mosca, ExxonMobil Chemical Company	Polypropylene Compounds with Enhanced Haptic Properties Katie Shipley, Asahi Kasei
11:30 - 12:00	Innovation for Automotive Coolant Hoses Phillippe Moureaux, Cooper Standard	Student Project Presentation on Weld Line Evaluations Jared Ide, Regis Cain, UMASS Lowell	Automotive Trends in Chrome Plating Plastic Frank Wagner, MacDermid, Inc.
12:00 - 12:30	Open	Higher Temperature PP-Based Composite Provides Nylon/PA-Level Performance at Lower Weight and Cost Jim Keeler, Albis Plastics Corporation	Open
12:30-1:30	Lunch Sponsored by Advanced Composites		
	Lightweight TPO Structural Applications Session Chairs: Laura Soriede & Dr. Jay Raisoni	Advances in Automotive Polyolefins Session Chairs: Patti Tibbenham & Neil Fuenmayor	Surface Enhancements Session Chairs: Dr. Rose Ryntz & Dr. Laura Shereda
1:30 - 2:00	Light Weighting TPOs and the Use of Alternative Fillers Tom Henry, ExxonMobil Chemical Company	PLENARY SPEAKER Material and Supplier Selection: Global Challenges and Evolving Expectations Kathy Minnich, Ford Motor Company	Advancements in Thermoplastic Elastomer Technology – Enhancing Mechanical Performance, Overmolding Adhesion and Sensory Attributes Dr. Ken Sienkowski, Kraiburg
2:00-2:30	Lightweight Pillar Trim with Cloth Appearance Joel Myers, HATCI	Supporting Global Vehicle Launches Successfully as a TPO Resin Supplier Dr. Michael Pohl ,Todd Glogovsky, Jane Horal, LyondellBasell	Superior Light Stabilizing Solution for PP-based Automotive Parts using Advanced Hindered Amine Light Stabilizers T. Horikoshi ,N.Tanji, N. Kawamoto, et al. ADEKA Corp & Amfine Chemical Corp.
2:30-3:00	Direct Incorporation of Glass Bubbles at the Press - a One Step Molding Process to Create Lightweight TPO Parts Baris Yalcin, 3M Company	The Role of TPO Compounds in Meeting Global Energy Demands Jim Hemphill, Kim Walton, The Dow Chemical Company	Interaction of Colorants, Active Ingredients and Fillers in Thermoplastic Resins Dr. Steve Goldstein, Clariant
3:00-3:15	Exhibitor Break		

	Salon A-C	Salon D-F	Dennison
	Lightweight TPO Structural Applications Session Chairs: Laura Sorieda & Dr. Jay Raisoni	Advances in Automotive Polyolefins Session Chairs: Patti Tibbenham & Neil Fuenmayor	Understanding TPOs Session Chairs: Hoa Pham & Dr. Tom Traugott
3:15-3:45	Foamed Polypropylene as a Replacement for Hard Polyethylene in HVAC Ducting Joel Myers, HATCI	Low Density TPO Development Using DFSS Methodologies for Vehicle Weight Reduction Jeff Tibbenham, Chrysler Group LLC	Polypropylene Usage in Automotive Applications Jeff Valentage, ExxonMobil Chemical Company
3:45-4:15	Innovative Polypropylene Lightweight Solutions with Excellent Dimensional Stability Michael Tranninger, Borealis Polyoelfine GmbH	HDPE-Based TPO Compounds and Their Feasibility in Traditional TPO Applications Steven Kauffman, Asahi Kasei	Rubber Toughened Polypropylene Compounds: A Materials Science Perspective Kim Walton, The Dow Chemical Company
4:15-4:45	Evaluation of Plastic Composites from Recycled Material and Polypropylene Brian Jacobs, J. David Schall, Faurecia Automotive & Oakland University	Compatibilizers and Surface Modifiers for Polyolefins using Copolymers with Brush Structures and Controlled Branch Molecular Weight Leticia Flores-Santos, Macro-M	Talc in Thermoplastic Olefins Frederic Jouffret, Saied H. Kochesfahani, Imerys Talc
4:15-4:45	New Findings on Talc-Based Additives for Stiffness Enhancement Piergiovanni Ercoli Malacari, IMIFabi S.p.A.	Next Generation High Performance Exterior TPOs Rachelle Kusch, ExxonMobil Chemical Company	Use of Functionalized Polyolefins in Plastic Applications John Yun, Chemtura Corporation
5:15	Networking Reception Sponsored by SABIC		

Wednesday, October 3

7:30	Breakfast
8:00	Introduction of Keynote Speaker: Bill Windscheif, Conference Co-Chair
8:15	**Alexander Buechler,** Owner and Publisher, HB Media "Less Polypropylene in Automotive Applications"
	Exhibitor Break

	Salon A-C	Salon D-F
	Large Part Thermoforming Session Chairs: Ed Bearse & David Okonski	Understanding TPOs Session Chairs: Hoa Pham & Dr. Tom Traugott
8:45 - 9:15	Improved Scratch Whitening for Thick Gauge, Low Gloss, Mold in Color Thermoforming Applications Kip Swain, Mytex Polymers	The Stabilization of Polypropylene & TPO-An Overview" Dr. James Botkin, Botkin Chemie
9:15 - 9:45	Solarkote® Acrylic Capstocks for TPO Thomas Richards, Arkema, Inc.	Fundamental Understanding of Scratch Behavior of Polymers Dr. H. Sue, M. Hossain, E. Moghbelli, et al, Texas A&M University
9:45 - 10:00	Break	
10:00 - 10:30	Thermoformed Application of TPO for the Ford F-250 LPG Tank Cover Program Craig Abernethy, Mytex Polymers	Automotive Thermoplastic Polyolefin: Coloring to Meet OEM Specifications Mark McKinnon, Uniform Color
10:30 - 11:00	TPO use in the Heavy Truck Market Roger Jean, Premier Material Concepts	Natural Exposure Testing vs. Accelerated Weathering – The Right Choice Alan Boerke, Q-Lab
11:00 - 11:30	New Developments in Flame Retardant Thermoplastic Polyolefin (TPO) Compounds Suitable for Extrusion-Thermoforming Applications Sunit Shah, LyondellBasell	Open
	Conference Concludes	
	Scratch and Mar Consortium: Dennison Room	

KEYNOTE SPEAKERS & SESSION ABSTRACTS

Keynote Speakers

Vincent G. Yuskiewicz
Energy Advisor Corporate
Strategic Planning
ExxonMobil Corporation

The Outlook for Energy: A View to 2040

BIOGRAPHY

Vincent Yuskiewicz is an Energy Advisor in ExxonMobil's Corporate Strategic Planning Department. In this capacity, he is responsible for assessing economic and energy trends, emerging energy technologies, and related market and public policy issues around the world. He is a principal contributor to ExxonMobil's long-term global energy outlook, including the identification of potential implications for energy markets and the Corporation's strategic plans. He is also active in communicating ExxonMobil's view of the energy future to a wide variety of audiences.

Vincent has worked in the energy industry for over 14 years in a variety of technical and management positions involving ExxonMobil's activities in the United States and around the world. He holds a B.S. in Civil Engineering from Drexel University. He and his wife have two boys and reside in Texas.

ABSTRACT

The Outlook for Energy: A View to 2040, which will address a long-term view of the world's energy future, including the more efficient use of energy through technologies such as hybrid vehicles. Yuskiewicz will discuss global energy demand, which is expected to rise by about 30 percent from 2010 to 2040. "ExxonMobil expects that demand growth would be approximately four times that amount without projected gains in efficiency," he says. "Efficiency is the key reason why energy demand will rise by only about 1 percent a year on average even as global GDP rises by nearly 3 percent a year. It also is the reason why energy demand in the developed world will remain relatively unchanged through 2040 even as its economic output nearly doubles. In transportation, ExxonMobil sees advanced vehicles, including hybrids, accounting for 50 percent of the cars people will drive in 2040, compared to about 1 percent today. This, plus improved fuel economy in conventional vehicles, will cause demand for energy for personal vehicles to remain essentially flat through 2040 even as the number of personal vehicles in the world doubles."

Patrick Stewart
Vice President and Executive
Director of Interior Systems
Inteva Products

Innovative Concepts for Automotive Interiors

BIOGRAPHY

Patrick Stewart leads the global Interior Systems product line team and is responsible for developing and executing global growth strategies, driving customer satisfaction, leading product and process engineering, advancing technology and innovation, and managing financial business decisions for Interior Systems.

Prior to joining Inteva in 2008, Stewart held a wide variety of assignments at Delphi and other suppliers. Hired in June 1985, he was given assignments in material and process, equipment and tooling, product engineering, product design, and program management. In 1998 Pat was appointed Launch Manager of the 2000 Mercedes W163 interior project and was promoted to manager for Global Product Engineering responsible for Interior Systems. He began his position as Chief Engineer of Interior Systems & Cockpits for Delphi in 2002.

Stewart received a bachelor's degree in Chemical Engineering from the University of Dayton in 1985. He also received a master's degree in Engineering Science from Rensselaer Polytechnical Institute in 1998. He is a graduate of Delphi's Lean College and attended leadership training at the Center for Creative Leadership. Pat is a Six Sigma Green Belt with extensive training in statistical quality and process control.

ABSTRACT

Innovative Concepts for Automotive Interiors

About his topic, Stewart says, "The automotive interior continues to evolve into a home away from home. What the OEMs considered luxury 5 years ago is now being styled into entry-level and mid-level vehicles. In addition, the pressure on fuel economy continues to drive the need for lower mass materials and systems. The challenge for the supplier is to deliver innovative materials and solutions to enable the styling, manage total system cost to the price point of the vehicle, with no sacrifice in performance, durability, and safety."

Keynote Speakers

Lisa Whalen
Vice President, Growth
Consulting Automotive and
Transportation
Frost & Sullivan North America

Throwing Light On the Future: Mega Trends and their Ability to Shape Personal Mobility

BIOGRAPHY

Lisa has over 16 years of management, research and consulting experience in the field of automotive. At Frost & Sullivan she has complete responsibility for fulfilling the business unit targets for Growth Consulting in terms of revenues, analytical, and consulting projects and reports.

Prior to joining Frost & Sullivan, Lisa spent over 12 years at General Motors in various leadership positions within several functions, including advanced technology and product planning, corporate and business strategy; sales and marketing; volume forecasting; production scheduling; and market research and analysis.

Lisa has a BA in Economics from Michigan State University and a Masters in Public Policy; Applied Economics from the University of Michigan.

ABSTRACT

Throwing Light On the Future: Mega Trends and their Ability to Shape Personal Mobility

Whalen explains, "This presentation will examine a variety of mega trends currently at work in society at large and discuss how they will impact personal mobility and the vehicles we use for personal mobility. We'll cover topics like the evolution of urbanization and smart cities, including implicit social changes, business-model evolution, and a look at the countries in 2020 that will be the next game changers beyond the BRIC (Brazil, Russia, India, China) nations. We'll also review the evolution of personal commuting and its effects on personal vehicles, and then explore future mobility innovations, including multi-modal commuting and alternative transportation plans already underway at various automakers. Since smart is the new green, we'll define what a smart connected car is and what that implies. We'll also look at the top 50 emerging vehicle technology trends, take a snapshot of a 'Zero-Concept' world in 2020, and then conclude with how to view from the macro level but implement from the micro level."

Howard Rappaport
Senior Director Chemicals
IHS Global Insight
Price & Purchasing

Global Polyolefins Overview

BIOGRAPHY

In 1999, Howard joined Chemical Market Associates, Inc. (CMAI) as Global Director of the Polyolefins Division. CMAI was purchased by IHS in May, 2011. Howard now serves as the Senior Director for Chemicals for IHS Global Insight – Price & Purchasing. He is currently responsible for the chemicals, commodity and engineering plastics services. He collaborates with the European, Asian and Middle East offices to contribute to various multi-client reports and global studies, as well as various single client consulting projects for IHS Chemicals Consulting Services Division.

Prior to joining CMAI in 1999, Howard held various chemical industry management level positions in commercial development, business management, product management, sales/marketing, and customer service. Company affiliations include American Hoechst, Huntsman Chemical, Webster Industries, Cain Chemical, Occidental Chemical, Himont, Montell Polyolefins, and Westlake Chemical.

Howard has been an active member in the Society of Plastics Engineers (SPE) since 1980, the Flexible Packaging Association (FPA), the Society of the Plastics Industry (SPI) and the American Plastics Council (now part of the ACC) and Canadian Plastics Industry Association (CPIA).

ABSTRACT

Global Polyolefins Overview

Rappaport notes, "The global polyolefin market is changing dramatically in response to the fast-advancing industrialization process in emerging markets, as well as improvements in global communications and trade liberalization. Investments are increasingly concentrated in feedstock cost-advantaged or high-demand growth areas, like the Middle East and the Asia/Pacific region. The same trend, particularly in West Europe, is driving industry consolidation, operations optimization, and moves toward the production of

Keynote Speakers

Global Polyolefins Overview contd.

higher value, performance products. In North America, low-cost feedstock from shale gas is revitalizing the polyethylene (PE) business, making PE exports highly competitive globally. Growth in polyolefin consumption will be mainly driven by the rapid economic development of numerous transition countries in the Asia/Pacific region, Central Europe, the Middle East, and South America. Higher monomer prices have significantly reduced the cost advantage polypropylene previously enjoyed vs. other polymers and that is limiting growth prospects in lower-end packaging applications. Recent high volatility in polypropylene prices and tight feedstock supplies, particularly in North America, are also adversely affecting consumption. Yet, polypropylene's excellent properties and versatility will continue to open new and higher value markets. The future shows continued strong consumption growth."

Alexander Buechler
Owner and Publisher
HB Media

Less Polypropylene in Automotive Applications

BIOGRAPHY

Mr Buechler was born in 1964 in Essen and studied mechanical engineering in Aachen specializing in laser technology where he was awarded a Master's Degree in Engineering. Held a number of positions of responsibility at various publishers including editor of Polymer Technology. In 1999 he established his own publishing company for plastic magazines. The first was PETplanet insider, focusing on the production of PET bottles, followed in 2004 by Polymotive, dealing with plastics in the automotive sector, and finally, in 2010 Plastruction, reporting on plastic applications in construction. Since 2007 he has been a member of the Blue Ribbon Judging Committee for the SPE Automotive Awards. Alexander Büchler is married with 3 children and lives in Heidelberg.

ABSTRACT

Less Polypropylene in Automotive Applications

On average there is 130 lbs (60 kg) of polypropylene in every car. Each year there are approximately 0.7 lbs (1/3 kg) fewer. Better flowing materials reduce the wall thickness, foamed polypropylene delivers less mass and the absence of heavy fillers such as talc means less and less polypropylene in the car. We show which components are affected, and the car segments where polypropylene is making a particularly strong return. In addition, we will be showing some contradictory trends in North America, Europe and Asia.

Automotive Interior Trim & Skin

SESSION MODERATORS
Robert Eller, Robert Eller Associates;
Yvonne Bankowski, Ford Motor Company

New Sustainable Surface Materials Concepts for Automotive Interiors

Dr. Juergen Buehring,
Benecke-Kaliko AG

In recent years, manufacturers of decorative surfaces for automotive interiors are increasingly faced with challenges such as the use of renewable raw materials or lightweight construction. Since sustainability is important, light weight solutions for decorative interior surfaces are being intensively investigated. A new polyolefin-based decorative surface material with lower density than PVC, PUR, or traditional olefins has been developed, offering a weight reduction up to 25% against conventional TPO materials and over 50% towards other traditional materials. This material also lowers CO2 emissions and increases foil softness. It also offers improved scratch resistance without restricting embossing properties and grain retention.

New HSBC Slush Molding Technology for Soft Skin Applications

Troy Wiegand, Kraton Polymers

In 2011, in excess of 100kt of polymer compound was used for automotive interiors where a soft feel was required. The bulk of this volume is attributed to instrument panels and door panels. Traditionally TPO materials have had less than ideal haptics. They are boardy and have a plastic feel similar to rigid polypropylene. Our products have been used extensively in automotive interior soft touch over-mold applications for decades. We have developed a new material to expand the use of TPEs into the slush molding process. Its low density translates into a 30% weight reduction from traditional PVC and TPU compounds. This presentation will explain the potential of TPE slush.

Advances in TPOs for Soft Automotive Interior Trim

Pravin Sitaram, Mark Helder,
Haartz Corporation

Since the introduction of TPO in automotive interior trim in the early 2000's, soft-trim TPO constructions have advanced dramatically. Research and development in TPO formulating and topcoat formulating has resulted in important improvements in numerous areas. Fine detail grain acceptance in negative-vacuum formed products is now a reality. Softer TPO constructions provide enhanced compressive touch. TPO based synthetic leathers for hand wrapped doors and instrument panels provide outstanding performance, craftsmanship, and substantial weight savings vs. competing technologies. And these products are best-in-class for low automotive interior emissions.

Meeting the Cosmetic Challenges for Interior Automotive Applications using Novel TPO Compound Designs

Joan Glogovsky, LyondellBasell

TPO resins are the material of choice for automotive interior applications due to mechanical performance, design versatility, and cost position. However, as automotive OEMs strive to increase perceived quality of vehicle interiors. new material features include: feel or touch of the surface after long-term exposure to sunlight and heat, ultra-low gloss, improved durability, odor, and carbon emissions. Such material requirements must not come at the expense of the impact-stiffness performance, nor a significant cost increase. Finally, these design challenges must be wrapped into a final product providing weight saving. This paper will review how new TPO design concepts can be utilized to meet new requirements.

Automotive Interior Trim & Skin

Applications of TPOs / TPEs in the Indian Automotive Market – Challenges & Opportunities for Global Suppliers

M. Damani, A. Damani, Zylog Plastalloys

India is the sixth largest automotive producer in the world. Over 75% of cars & SUV's sold there are small, entry level & compact segment where TPOs / TPEs are used in applications ranging from bumpers to instrument panels. As India emerges as an export hub for small / compact cars, the local compounders have successfully developed materials complying with global specifications and standards. This presentation describes the current application of TPOs / TPEs and PP compounds, with primary focus on bumpers and instrument panels, This paper will also provide insight into the local compounders and the concern about offshore suppliers.

New TPV for Automotive Applications (ESPOLEX® 6000 series)

Shuhei Ono, Sumitomo Chemical Company

We have recently developed a series of new TPVs. These TPVs are targeted for automotive applications. The advantages of these new TPVs are their improved physical properties with excellent elasticity, including improvements in compression set. The new TPVs were developed through the use of improved compounding technologies and polymer design to achieve superior appearance with excellent elasticity and performance. This presentation is focused on the design of reactive blending used to develop these new TPVs.

Dolphin Soft Touch Core Back Process

Vittorio Bortolon, SO.F.TER. S.p.A.

Dolphin material came about through a bio-based dolphin concept. The material is a thermoplastic block copolymer formed by rigid crystalline PBT segments and soft amorphous long chain polyether segments. The structural carrier ABS/PC alloys have unique properties and technical requirements. The skin foaming "Dolphin" material's haptic and aesthetic results are excellent, with a series of customized finishes such as the differentiated skin grain zones, the lack of joints, and a wide range of possible colors. The skin meets regulations of the automotive industry such as high resistance to UV rays, temperatures, and scratches. This presentation will discuss new carrier material development.

Rigid Polyolefin Compounds

SESSION MODERATORS
Mike Balow, Asahi Kasei Plastics, North America;
Ermanno Ruccolo, Mitsui Plastic, Inc.

The Effects of Types of Coupling Agent and Fiber Glass Type on the Mechanical Properties of PP LFT Materials

Jaap van der Woude,
Creig Bowland,
PPG Industries Inc.

The relevant parameters that determine the properties of Long Fiber Reinforced Polypropylene Thermoplastics have been studied. The effects of glass type sizing and glass content, amount of additives MA-g-PP (coupling agent) and melt flow of the resin are presented. Various samples of Polypropylene Long Fiber Thermoplastics pellets (PP GLFT) were compounded with various coupling agent loadings and using different melt flow homopolymer polypropylene resins. Glass Fiber contents varied from 30% to 50%, molded and tested. As part of the above relationships the properties of the coupling agents are studied and correlations between the maleic anhydride content, melt flow, and base polymer were analyzed through compounding with various coupling agents.

Novel Organic Long Fiber Filled TPO Materials for Solid and Foamed Interior Parts

Motoko Ito, Japan Polypropylene

A family of TPO material systems applicable for both solid and foamed car interior parts are introduced. This new TPO material technology utilizes organic long fibers as a reinforcement, and will expand performance and functionality beyond conventional talc filled TPO systems. The key benefits of the systems include: light weight, impact resistance at low temperatures, scratch properties, high temperature stiffness, and better foamability than conventional systems. The novel JPP material technologies through TPO compounding with new organic long fibers can achieve large improvements in impact strength, modulus and heat-deflection temperature.

A Low Moisture, Wood, Cellulose Flour Composite Compound with Improved Performance and Cost Structure for Material Replacement and Share Shift Applications

Robert Joyce,
Innovative Plastics & Molding

In order for biopolymers to be used in automobiles, they must achieve better performance, and lower costs. Some biopolymers are currently being implemented, but few that display complex shapes are used in automotive interiors. Whether the biomass feedstock is a reinforcement or a filler with a polyolefin, molding complex shapes above 390 F can lead to degradation, odor, and difficulty to color. We have developed a biopolymer that performs as a natural fiber alloy composite by increasing the adhesion and thermal properties; it can be formed using established processing techniques. In this talk we will present a way to make parts with lower specific gravity, increased flexural strength, better toughness and scratch resistance.

Weight Saving Material for Instrument Panels

Jeff Webb, Ford Motor Company

Our company is aggressively focused on weight savings as fuel economy requirements become more difficult to meet and traditional methods have been exhausted. In the past, plastics have been used as "one for one" replacement of steel components within the interior but have resulted in weight and cost penalties. Improved analytical methods for both structural and molding analysis have paved the way for the re-emergence of plastic composites in automotive applications. A wide menu of fillers, resins, molding processes, bonding techniques, and designs are all available. Is there one combination that becomes the "Main Dish" for interiors, or is it more of a "pot luck" meal? Ford Motor Company is taking the lead in developing the solution and in turn hopes to develop a cost neutral game changing use of structural composites to achieve its weight savings targets.

Rigid Polyolefin Compounds

Challenges & Comparison Between The Emission Reducing Strategies and Technical Requirements for Materials, Parts and Complete Vehicles by Car Manufacturers Over the World.

Dr. H.P. Schlegelmilch, M. Eickeler, M. Holzwarth, H.W. Müller, S. Hilbig, imat-uve Group GmbH

Car manufacturers' policy of reducing emissions of materials used in car interiors has been affected by public press & discussions about the influence on passengers´ health & safety. For emission reduction, different car manufacturers have taken unique paths in how to reduce emissions inside the cabin. This has resulted in an evolution of different test methods and technical regulations as well as challenges for automotive supplier networks around the world. The author will speak about these relationships and will give orientation for international active material and part suppliers.

Recent Advances in Low Carbon Emissions and Odor PP Compounds

Vaibhav Apte, Asahi Kasei Plastics, North America

There is a growing awareness among consumers regarding Carbon Emissions and odor producing chemicals emanating from automotive interior plastics parts. Consumers now associate the new car smell with harmful chemicals. This awareness has driven Auto OEM's to reduce carbon emissions and odor for materials used in automotive interior components. This paper will discuss current global carbon emissions trends and describe the test methods used to characterize carbon emissions and odor. Test data for newly developed low carbon emission and odor compounds are compared to their standard counterparts. A comparison of LTHA characteristics for low carbon emissions and odor compounds vs. standard grades is also presented.

Volatile Organic Compounds in Automotive Interior Applications

Mark Chahl, ExxonMobil Chemical Company

Reducing Volatile Organic Compounds (VOCs) and improving automobile interior cabin air quality has gained greater attention over the past several years due to increased public awareness and increased government regulations on interior air quality. Several OEM's have implemented VOC reduction efforts to improve cabin air quality to enhance customer satisfaction and comply with local government regulations. However the industry lacks globally accepted test standards and product performance requirements. This presentation will focus on approaches to reduce interior cabin VOCs, test methods, and balancing VOC reduction with the effect of material quality.

Automotive TPEs

SESSION MODERATORS
Robert Eller, Robert Eller Associates;
Jeff Valentage, ExxonMobil Chemical Company

PLENARY

TPEs: Positioning for Success in the Global Automotive Sector

Robert Eller,
Robert Eller Associates

TPEs have established a foothold in automotive applications against a range of incumbents including PVC, rubbers (primarily EPDM) and thermoset polyurethanes. Whether the foothold can be extended to a dominant position remains and will depend on a number of materials, process technology and manufacturing cost parameters.

This paper positions the life cycle position of TPEs in mature and evolving automotive applications; examines the key forces driving or restricting TPE substitution; examines the success factors for several key applications; evaluates how the shifting requirements of global vehicle production affect TPE penetration; and compares regional differences affecting TPE penetration and future potential.

Why TPE-S Forms the Best TPE Alternative to EPDM Replacement for Automotive Glazing Systems

Jason Clock, Benoit Burel, CTS

While the TPE-S (SBC based) type TPEs were regarded with some suspicion during the early stages, more than a decade of experience has highlighted some of their specific properties that enable the integration of new features to sealing systems of automotive glass, outclassing EPDM and other thermoplastic alternative solutions like PP/EPDM TPV. This presentation will provide information on a selection of commercial and development grades dedicated to the automotive seals market and on how SBC based TPEs cover all functional requirements including: low compression set, good relaxation behavior, abrasion resistance, weather resistance and heat ageing, and possibility for complex design.

Overview of EPDM/TPE Hybrid Systems

Sebastian Roux, SaarGummi

EPDM & TPE Hybrid Solutions in automotive sealing applications contribute to the overall weight reduction of an automobile at a competitive price, therefore combining the advantages of both material properties. TPE materials usage is becoming more and more important in sealing systems, therefore creating new opportunities and commercial applications at AUDI, BMW and other OEMs. This presentation will highlight our strength for innovation, and capability in understanding and developing rubber and plastic materials and their combinations.

Understanding the Friction Effects of Polyamide (PA) and Polyester (PE) Flocked Contact Area on a Car Door Seal in Respect to Squeak and Itch Noises

Mahmoud Oumohand, R. Santoni,
Cooper Standard, France

Cars doors are usually sealed against water, air ingress and leakage around the glass using flexible elastomeric weather seals. Today vehicle owners perceive squeaks and itch noises of the sealing systems as a major negative indicator of vehicle build quality. Squeak noise is generated by stick-slip sliding under certain conditions of humidity and temperature. This paper deals with the characterization of the friction parameters of the glass / seal contact under humid conditions and tries to establish a control parameter that prevents stick-slip motion. Also described is the FEA approach aimed at coupling the seal normal force to the friction characteristics of the material pair in contact.

Automotive TPEs

Innovative Weatherseal Attachment Solutions

Jim Schoonover, Vintech

Automotive extrusion profiles typically require secondary holes to be punched or drilled in which push pins would be installed either manually- off-line or in-line- requiring use of expensive capital equipment and tooling. These types of secondary attachment features can fall out or can be difficult to install during the final part assembly potentially causing part rejects or part failures in the field. This presentation will focus on key issues including: varying approaches to reducing overall failure modes for attachments, and alternative methods to push pins to attach extrusions on mating parts.

Applying TPV Seals to Improve Sunroof Sealing Performance

John McGovern, JYCO Sealing Technologies

TPV is an ideal material when applied in sunroof seal applications. TPV materials place less stress on the environment than thermoset materials with a lower specific gravity and the continued ability to be recycled. In addition, the general overall cost of TPV sunroof seals is significantly less than alternative thermoset rubber sunroof seals; this coupled with the fact that TPV is continually being developed with new technologies drive it as the material for the future. This presentation will be a discussion of TPV sealants.

Dynasol Proposes Innovative Solutions for Thermoplastic Elastomers (TPEs)

Mariano Ramirez, Dynasol

Every year thermoplastic elastomer (TPE) consumers demand new products that require increases in properties and performance that cannot be reached with current synthetic rubbers. Hydrogenated Styrene-Butadiene Block Copolymers (SEBS) are among the SBCs, have a high growth rate in automotive applications and offer an optimal balance between cost and performance. In this presentation we will describe a series of SEBSs with radial structure that are most suitable as alternative for TPE applications based on their advantages and performance.

Innovation for Automotive Coolant Hoses

Phillippe Moureaux,
Cooper Standard, France

We have developed a new material for automotive coolant hoses. The material is a TPV with high temperature (150°C) and steam resistance, which did not previously exist on the market. These new TPV hoses are used in the cooling system of car engines. Advantages of this innovation include significant weight reduction, decrease in gasoline consumption and CO2 emissions, and use of green material and recyclability. It has also created solutions for the whole coolant circuit. The hoses have flexibility close to a rubber and decreased pressure loss than with corrugated tubes. So far, these TPV hoses have passed all the requirements of car manufacturers.

Part Design, Tooling and Processing

SESSION MODERATORS
David Okonski, General Motors R&D;
Chuck Buehler, General Motors

PLENARY
Polyolefin Properties versus Simulation Accuracy

David Okonski, General Motors R&D

The usefulness of thermoplastic injection-molding simulation is influenced by many simulation inputs – such as the modeling of part geometry, mesh type and density, mathematical solution, process settings, thermoplastic material properties (both as a melt and as a solid), and the material properties of the tooling alloy. The primary focus of this presentation is the influence of material properties data on simulation precision and accuracy. Several case studies involving polyolefins will be utilized to demonstrate the sensitivity of simulation results to key parameters in the material properties data file – the .udb input file.

Tiger Stripe Simulation: the Next Level in Prediction and Material Development

Tobias Allmendinger, Borealis Compounds Inc.

Tiger Stripes are a fascinating topic, especially for TPO compounds. Car parts are becoming bigger, wall thickness is decreasing and requirements on the surface are increasing. In this presentation, we will introduce a tool to simulate and predict tiger stripes and explain how it can be utilized for new material developments.

How to Reduce Molding Defects in TPO Molding with Moldflow 3D Venting Simulation

Don Kosheba, Asahi Kasei Plastics, North America

The importance of proper venting is largely overlooked in mold making or design reviews. Lack of proper venting causes defects such as splay, bubbles, and burning at end of fill or gas entrapment areas. New features of Autodesk Moldflow allow simulation of not only plastics flow into a mold cavity, but the pressurization and exiting of gas from the cavity. We now have the ability to add venting criteria to a CAE model and evaluate its effect on the flow of resin into a cavity. This presentation demonstrates how best to use this technology to add venting to injection molds before they are built. Limitations of this new technology and future steps needed to improve upon this solver will also be addressed.

Moldflow Simulation for Thin Wall TPO Interior Components to Reduce the Molding Defects

Jeff Webb, Li Qi, Ford Motor Company

TPO is widely used for automotive interior trim. Its mold-in-color properties have allowed it to replace painted parts, in order to reduce cost. However, meeting the government CAFÉ standard of 54.5 mpg by 2025 is a big challenge for the automotive industry, and one component is weight reduction. Ford has set aggressive targets of over 25% Weight Reduction for all its components. This requires an analytical approach including manufacturing process simulation, advanced material characterization, and product requirement simulation. This paper will illustrate how Ford uses Mold Filling analysis prior to tool kick-off to ensure part quality, weight reduction, manufacturing feasibility and significantly reducing costly part design churn.

Part Design, Tooling and Processing

Injection Moulding Quality Control Through Mutivariate Analysis

David Calder, Polycon Industries

Visual inspection of cosmetic defects on large automotive exterior parts is an extremely subjective, unpredictable, and inconsistent task. The experience of the inspector and the severity and location of the defect significantly impact the effectiveness of the inspection process. The intent of this presentation is to illustrate how multivariate analysis (MVA) can be utilized as an alternative method of detecting moulding defects. The presentation will detail how key moulding parameters were selected for the MVA model, how the MVA model was developed and validated, and the effectiveness of quality control based on parametric release.

Novel Methods and Surface Activation Qualification for Flaming Parting Line Flash

Stephen Putnam, Jim Moore, T. Glogovsky, Polycon Industries, LyondellBassell

Parting line flash can be quickly removed from TPO components by brief exposure to flame. However, the surface composition of TPO is very sensitive to flame exposure. Brief flame exposure can be beneficial in other ways: it oxidizes the uppermost few molecular layers of the TPO, increases surface energy, and can improve paint adhesion considerably. Verifying the amount of exposure is also an important part of quality control in manufacturing. A common technique for determining treatment level is using dyne solutions to estimate total surface energy of the treated surface. Contact angle measurements also work. This presentation discusses the relationship between flame treatment levels and surface wetting characteristics.

Open Compound Concept for Automotive Applications

Ralph Mosca, ExxonMobil Chemical Company

In automotive applications it is not uncommon to have part fit issues even when a part has been produced to the specified dimensional requirements. Vehicle build variations, multiple parts, and stack tolerances can cause a part not to fit. Common practice has been to have the material supplier make a "slight tweak" to the product to adjust the shrinkage of the material. The Open Compound Concept or blending a Masterbatch + Base PP at the press provides the molder with an alternative. The concept gives the molder greater flexibility to make adjustments at the press depending on the part dimensional requirements. The presentation will provide an overview of the benefits, limitations and examples of the open compound concept.

Student Project Presentation on Weld Line Evaluations

Jared Ide, Regis Cain, UMASS Lowell

Thermoplastic Olefins (TPO) are commonly used in the automotive industry because of their high impact properties, flexibility, and ease of processing. In order to quantify the effect of process conditions on weld line strength, a DOE was performed that varied temperature and injection velocity. A duel gated ASTM test bar mold was instrumented with pressure transducers at critical locations inside the cavity. The pressure data collected show a correlation between weld line strength and pressure experienced at the forming weld line. The results from this experiment can be used to improve manufacturing and processing of automotive parts.

Higher Temperature PP-Based Composite Provides Nylon/PA-Level Performance at Lower Weight and Cost *Jim Keeler,* Albis Plastics Corp.

With light vehicles becoming a highly preferred consumer product globally, governments have been addressing energy consumption and environmental impacts with increasingly stringent regulations. New plastic materials are an essential part of the solution path allowing automotive engineers to replace metal or higher cost plastics, lightweight parts through increased strength for lower total part cost, and switch to lower density material solutions. A new polypropylene-based compound offering nylon-like properties at lower total cost and weight has been developed. Properties of this new material will be compared to traditional automotive materials, including mechanical and thermal properties as well as hot oil and oven aging. Target applications that would benefit from this performance profile will be mentioned.

Surface Enhancements

SESSION MODERATORS
Dr. Rose Ryntz, International Automotive Components;
Dr. Laura Shereda, Inteva Products

Understanding Scratch & Mar-Induced Deformation Mechanisms in Polymers Using Finite Element Method

M. Hossain, Dr. H. Sue, Texas A&M University

Parametric studies on scratch behavior of polymers using FEM have long been employed to fundamentally understand the influence of surface and material properties on scratch-induced deformation mechanisms. 3D finite element method (FEM) parametric studies were performed to investigate how scratch depth and shoulder height development are affected by surface friction and constitutive behavior of polymers during the scratch process. The FEM simulation shows that the shoulder height and scratch depth formation are strongly influenced by compressive yielding and post-yield constitutive parameters, i.e., yield stress, strain at stress recovery, and strain hardening slope beyond the strain at stress recovery in compression.

Quantitative Machine Vision Assessment of Mar Visibility of TPO Surfaces

Allan Moyse, Noah Smith, M. Hossain, Dr. H. Sue, Texas A&M University

We propose a statistical solution for mar feature analysis of polymer surfaces. Previous analytical methods are unable to correctly characterize the large-surface area features of mar damage. Our method considers the first moment of foreground image statistics as a luminosity curve for determining onset of visibility of mar damage. The onset of visibility is determined by a commonly accepted 3% of contrast against background luminosity over the course of the mar. We show that this solution is consistent with human observation for most cases, and can be used as a measure of aesthetic mar resistance performance.

Polypropylene Compounds with Enhanced Haptic Properties

Katie Shipley, Asahi Kasei Plastics, North America

Studies show that haptics play a role in decision making processes. Soft surfaces augment the user experience and provide value added characteristics to critical applications. Consumers are often more likely to make a purchase after touching an item, so it is important to consider the role that a positive tactile experience can have on car ownership when selecting materials for interior surface applications.

New product developments from Asahi Kasei combine varying levels of strength and stiffness with enhanced haptic properties and excellent low temperature impact performance. These enhanced haptics eliminate the need for painting or overmolding of plastic materials in order to achieve the sought-after pleasant surface feel.

Automotive Trends in Chrome Plating Plastic

Frank Wagner, MacDermid

Plating plastic for automotive decorative trim is a growing market. With increased pressure of environmental concerns and the need to eliminate chromic acid used in etching plastic and problems with supply of consistent ABS and PC/ABS blends, platers, tiers, and automotive companies are looking for alternatives. Multiple plastics have been evaluated to replace these materials aesthetically and functionality with alternatives to chromic acid etching. We have identified new technologies enabling the industry to plate a host of different plastics with greatly improved adhesion and physical properties. We have found new ways and materials that can be used to replace metals with industry composites.

Surface Enhancements

Advancements in Thermoplastic Elastomer Technology – Enhancing Mechanical Performance, Overmolding Adhesion and Sensory Attributes

Dr. Ken Sienkowski,
Kraiburg Corporation

KRAIBURG TPE has created thermoplastic elastomers with the addition of innovative blends and alloys, specifically designed for challenging 2-component over-molding adhesion applications where improved mechanical performance is critical to end-use durability. These novel materials provide improved oil and chemical resistance along with and significantly higher tear, tensile and elongation properties as compared to traditional SBC-based compounds. This presentation will detail the potential value such property improvements can provide in soft-touch or over-molding design. Additional benefits associated with enhanced haptics and improved scratch and mar resistance will be highlighted.

Superior Light Stabilizing Solution for PP-based Automotive Parts using Advanced Hindered Amine Light Stabilizers

Takahiro Horikoshi, N. Tanji, N. Kawamoto et al.,
ADEKA Corp. & Amfine Chemical Corp.

Polypropylene automotive parts exposed to sunlight must be stabilized to suppress the deleterious effects of prolonged exposure to ultraviolet light. Today, hindered amine light stabilizers (HALS) are utilized to prevent degradation under UV radiation and several types of HALS are available in the market. In this study, an advanced N-H type HALS system demonstrates remarkable weathering resistance. N-Me type HALS showed not only good light stability but also high thermal stability. A new novel NO-alky type HALS offers excellent light stability particularly for parts exposed to acid conditions. This paper describes the appropriate usage of the different types of HALS for a number of desired improvements of automotive parts.

Interaction of Colorants, Active Ingredients and Fillers in Thermoplastic Resins

Dr. Steve Goldstein,
Clariant Corporation

There are positive and negative interactions that can occur in creating a stable formulation with a Thermoplastic resin. This paper will give examples of colorant, active ingredients and fillers interactions that may be used in formulating finished plastic articles.

Lightweight TPO Structural Applications

SESSION MODERATORS
Laura Soriede, Ford Motor Company;
Dr. Jay Raisoni, JR Plastics

Light Weighting TPOs and the use of Alternative Fillers

Tom Henry, ExxonMobil Chemical Company

Due to increased fuel economy requirements globally OEMs continue to look for ways to reduce vehicle weight while still maintaining part performance. Over the next decade vehicle weight will likely need to decrease 200 - 350 kg to improve MPG, maintain performance and still offer the occupants all of the in vehicle conveniences they have been accustomed too.

Plastics and TPOs specifically can continue to play a significant role in helping OEMs meet their weight reduction targets. A wide variety of fillers are available today to help reduce the traditional loading levels using talcs and ultimately the finished product density. The presentation will provide an overview of the various fillers available, key benefits and challenges.

Lightweight Pillar Trim with Cloth Appearance

Joel Myers, HATCI

Talc is currently used as a filler, however, now options such as Volcanic filler, Fiber Pile, Glass Bubble, and conventional vs. new compounding process are available. Previous Material Construction Options included Cloth/Paint (Soft Feel) and mold in color (Hard Feel). In this presentation we will compare process, tactile feel, process, density, cost, and vehicle class application for each material specified. New fillers will be introduced to make changes in Scratch, weight, cost, haptics, VOC, etc. In this report we will talk about using Glass Bubbles to reduce weight, applying a direct compounding process, and optimization of filler content.

Direct Incorporation of Glass Bubbles at the Press – a One Step Molding Process to Create Light Weight TPO Parts

Baris Yalcin, 3M Company

Reducing the weight of plastic parts has been a critical objective for the automotive industry due to increasing governmental carbon emission and mileage regulations. High strength -low density glass bubbles (hollow glass microspheres) can be used as weight reducing micro additives for plastics. They are specially engineered to withstand high temperature, and shear gradients in processes including melt compounding and injection molding. In this presentation, we present our preliminary findings on "master batching" as well as "direct glass bubble incorporation at the press". We will also present structural and mechanical properties of these light weight TPO parts.

Foamed Polypropylene as a Replacement for Hard Polyethylene in HVAC Ducting

Joel Myers, HATCI

A new foamed Polypropylene material for HVAC ducting is proposed by HATCI that provides (85%-90%) mass reduction and reduces cost of the current hard Polypropylene system. The prototype ducting shows equivalent performance to the current duct in air flow, cool/heat performance, vibration, engine, and blower motor NVH. This new material can be attached using the same fasteners that are currently used, but it is recommended to change to plastic push pins for a cost reduction. While the prototype part performed well in the testing additional design considerations are needed for production to improve sealing to HVAC case and air distribution.

Lightweight TPO Structural Applications

Innovative Polypropylene Lightweight Solutions with Excellent Dimensional Stability

Michael Tranninger, Borealis Polyolefine GmbH

Lightweight PP parts contribute to overall weight reduction in vehicles, therefore saving fuel and lowering CO2 emissions. Additionally, the aesthetics of the car interior are becoming more and more important. To overcome challenges in material design, Borealis will introduce new PP material designed to provide excellent mechanical properties, low shrinkage, and CLTE combined with low density.

A key success factor of the latest developed TPO compounds is a process which enables tailor made solutions for demanding applications. Secondly a highly accurate, fully automated shrinkage measurement method linked with Software Moldflow underlines the capability of Borealis as solution provider.

Evaluation of Plastic Composites from Recycled Material and Polypropylene

Brian Jacobs, Faurecia Automotive and Oakland University;
J. David Schall, Oakland University

To reduce landfill biomass and increase end life of precious materials, several reinforced composites are investigated. Coal fly ash, shredded U.S. currency, paper mill sludge, and recycled carbon fiber were combined with a virgin copolymer to produce an injection molded composite material. Mechanical properties such as tensile strength, flexural modulus (23 C), and heat deflection temperature were tested with the goal of reducing weight and cost, while creating a "green" composite. Recycled carbon fiber composites have proved much stiffer than a greater percentage glass filled composite, and may find application in small, structural components or large, thin reinforcements which require high stiffness.

New Findings on Talc-based Additives for Stiffness Enhancement

Piergiovanni Ercoli Malacari, IMIFabi S.p.A.

Very fine to ultrafine talc is generally used in PP/TPO resins as an active modifier to enhance stiffness, lower molding shrinkage, and to minimize CLTE. We have developed a new additive, produced by combining highly micronized talc with the outstanding reinforcing properties of inorganic synthetic fibers. This results in a 20% increase in stiffness compared to a highly micronized talc. An innovative compaction process achieves a truly free flowing and dust free powder, with extraordinary bulk density retention and proper dispersability in plastics. It flows in every condition and doesn't show any bridging or funneling during handling. In this paper the latest findings on NTT products will be presented in comparison to existing additives.

Advances in Automotive Polyolefins

SESSION MODERATORS
Patti Tibbenham, Ford Motor Company;
Neil Fuenmayor, LyondellBasel Industries

PLENARY

Material and Supplier Selection: Global Challenges and Evolving Expectations

Kathy Minnich,
Ford Motor Company

In a competitive global market many internal and external drivers influence the selection of supplier partners as well as materials for part applications beyond meeting functional performance requirements. This presentation will provide an overview of the drivers and probe the evolving expectations for the OEM Materials Engineer and the Material Supplier.

Supporting Global Vehicle Launches Successfully as a TPO Resin Supplier

Dr. Michael Pohl, Todd Glogovsky, Jane Horal, LyondellBasell Industries, PP Compounds

As automotive OEMs look to improve speed to market through compressed launch times, and at the same time drive improved product quality and consistency, material suppliers are required to provide a single product consistent in performance and quality between all regions. This allows OEMs to reduce validation time on parts and the vehicle while maintaining consistency and improving performance. The scope of the discussion includes basic development or new innovation of a compound, commercialization, OEM approval, product translation and product characterization. Challenges involving product consistency with global translations requires early design and manufacturing consideration.

The Role of TPO Compounds in Meeting Global Energy Demands

Jim Hemphill, Kim L. Walton, Takahiko Ohmura, Russell Barry,
Dow Chemical Company

Increasing global oil demand and environmental concerns have prompted the automotive industry to seek solutions that maximize fuel efficiency and minimize exhaust emissions. The automotive industry has a number of ways to meet these mandates, for example: alternative power trains, improved engine efficiency, and weight reduction. Emphasis on weight reduction demands TPOs with a higher stiffness/toughness balance to enable additional material replacement and thin-walling. Thus, rigid TPO specifications must continue to evolve, reflecting this increasing performance demand. The present challenge is enabling the manufacture of components that meet the OEM criteria of stiffness, impact, and aesthetics while reducing weight.

Low Density TPO Development Using DFSS Methodologies for Vehicle Weight Reduction

Jeff Tibbenham, Chrysler Group LLC; ***Melissa Cardenas,*** LyondellBasell

In order to meet ever-tightening government mandated mileage and CO2 emissions targets, vehicle mass must be reduced. Mass reduction of exterior ornamentation components is particularly challenging since the size and shape of exterior ornamentations is primarily dictated by studio designers, One way to reduce mass of these components is to decrease the density of the resin used to mold the component. We have reduced the density of TPO for fascia and exterior component applications using Design for Six Sigma (DFSS) methods. By applying DFSS to reduce TPO density, a significantly lighter TPO resin for fascia and exterior component applications is produced while simultaneously maintaining flexural modulus and cold impact.

Advances in Automotive Polyolefins

HDPE-Based TPO Compounds and their Feasibility in Traditional TPO Applications

Steven Kauffman, Asahi Kasei Plastics, North America

Ongoing price volatility in the Polypropylene market continues to cause turbulence for independent plastics compounders and parts manufacturers, and breeds caution in specifying PP compounds for new applications. The comparative historical market stability of Polyethylene along with the potential feedstock cost advantage of ethylene from US shale gas-derived ethane appear to make PE an attractive alternative base for traditional TPO-type applications. In this presentation, characteristics of new HDPE-based TPO compounds are investigated along with developments in alloying HDPE/PP blends. Positive aspects and limitations of high impact HDPE compounds will be discussed and compared with traditional TPOs.

Compatibilizers and Surface Modifiers for Polyolefins Using Copolymers with Brush Structures and Controlled Branch Molecular Weight

Dr. Leticia Flores-Santos, Macro-M

The design of Polyolefin additives is of special interest because these materials have low polarity, low affinity towards fillers and other thermoplastics. The synthesis of additives is challenging since the processes used to obtain Polyolefins usually do not tolerate polar monomers or functional groups and the processes used to obtain polymers with functional groups (e.g. acrylics or styrenics) cannot incorporate Polyolefins precursors. Reactive extrusion can be used to incorporate functional or polar monomers to Polyolefins, but there are disadvantages. This presentation features new additives that combine control of properties and performance in the modification of TPO's.

Next Generation High Performance TPO for Exteriors

Chris R Davey, Rachelle Kusch, ExxonMobil Chemical Company

The continued evolution of TPO performance has provided the automotive industry with opportunities to significantly reduce weight, improve processability, and enhanced styling and aerodynamics versus metal or engineered thermoplastics. OEMs continue to push the application limits to further reduce weight and costs requiring products with increased MFR and Stiffness to meet future targets. This presentation will focus on key performance aspects and challenges of developing TPOs with a very high MFR/ stiffness balance while maintaining other key performance attributes.

Understanding TPO

SESSION MODERATORS
Hoa Pham, Avery Dennison;
Dr. Tom Traugott, Advanced Composites

Polypropylene Usage in Automotive Applications

Jeff Valentage, ExxonMobil Chemical Company

Polypropylene has become one of the most widely used products in the automobile. Today polypropylene accounts for approximately 35% of the plastics used in the vehicle. The products' versatility and balance of performance allow the material to be utilized in a wide variety of processes and components. Polypropylene can be further enhanced with fillers, impact modifiers and other additives to produce TPO compounds.

The presentation will focus on the various polypropylene products utilized today in a variety of applications and will outline the performance attributes required. Additionally an overview of the range of polypropylene materials available as base resins for TPO compounds will be provided.

Rubber Toughened Polypropylene Compounds: A Materials Science Perspective

Kim L. Walton,
Dow Chemical Company

The technology of plastics rubber toughening has evolved significantly over the decades, enhancing the stiffness-toughness performance of a wide variety of rigid polymers, including polypropylene. New elastomer developments have enabled polypropylene based compounds, commonly called thermoplastic olefins (TPO), to penetrate into automotive markets previously obtainable only by engineering thermoplastics. Although many questions remain, a significant body of experimental and theoretical work has illuminated key elastomer parameters critical to polypropylene impact toughening. Strategies to improve impact efficiency and a brief analysis of commercially used impact modifiers will be given.

Talc in Thermoplastic Olefins

Frederic Jouffret, Saied H. Kochesfahani, Imerys Talc

Thermoplastic olefins (TPOs) are composed of three primary materials/phases: an olefinic plastic, an elastomer, and a reinforcing agent. The function of the reinforcing phase is to enhance the strength, rigidity and dimensional stability of the material, which are negatively affected by the elastomeric phase to meet or typically exceed the properties of the olefinic plastic. Talc has been consistently used as the reinforcing agent of choice due to the cost-performance advantages that it offers. The objective of this presentation is to review the structure, morphology, and characteristics of talc and use them to explain talc functions in plastics, and how these factors affect talc behavior and functions in TPOs.

Use of Functionalized Polyolefins in Plastic Applications

John Yun, Chemtura

Employment of polymer modifiers has been rapidly increasing and finding new applications due to their unique ability of giving rise to compatibility of chemically dissimilar materials in polymer composite and polymer blend system. Synergy of combining dissimilar materials resulting from optimized compatibility offers effective and efficient solutions where one single material cannot. This paper focuses on advancement of polymer modifiers' applications.

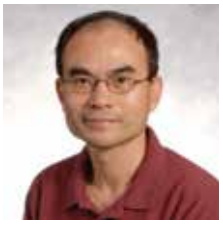
Understanding TPO

The Stabilization of Polypropylene & TPO: An Overview

James H. Botkin, BotkinChemie

Polyolefin-based materials such as polypropylene and TPO are widely used in the automotive industry due to their good balance of physical properties, ease of processing, recyclability, and good cost-performance. These materials must be properly stabilized in order to meet the weatherability and long term thermal stability requirements of automotive interior and exterior applications. This is normally accomplished using additives such as antioxidants and light stabilizers. This presentation will provide an overview of thermal and photo-stabilization additives for polypropylene and TPO, with an emphasis on products useful in thick-section automotive applications.

Fundamental Understanding of Scratch Behavior of Polymers



Dr. H. Sue, M. Hossain, E. Moghbelli, H. Jiang, Texas A&M University

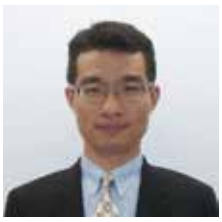
Scratch-induced deformation mechanisms in polymers vary with material properties and surface characteristics. Knowledge on how scratch-induced damage features are influenced by bulk mechanical and surface properties is highly desirable. Through extensive experimental observations and modeling work we have gained fundamental insights on how different scratch-induced damage mechanisms evolve in polymers. The formations of key scratch-induced deformation features responsible for scratch visibility and deleterious properties of polymer surfaces, have been correlated with the bulk material parameters and surface properties of polymers. Preparation of scratch resistant polymers will also be discussed.

Automotive Thermoplastic Polyolefin: Coloring to Meet OEM Specifications

Mark McKinnon, Uniform Color Company

With continued expansion of TPO in the automotive market, master batch suppliers need to evolve their processes and techniques to achieve OEM color standards. Most OEM standards are made from reactor grade Polypropylene. These standards are used as targets for varying resins including TPOs. Due to the inherent characteristics of TPO and their fillers, deep shades like blacks, dark blues and dark greens, and chromatic colors like reds, bright blues and yellows, present challenges to meeting the intended color. This paper will cover increased pigment loading, pigment selection and processing as critical factors to consider while trying to meet these standards.

Natural Exposure Testing vs. Accelerated Weathering – The Right Choice



Alan Boerke, Q-Lab

Weathering and light exposure are typical causes of damage to coatings, plastics, adhesives, sealants, and other organic materials. This damage includes gloss loss, fading, yellowing, cracking, peeling, embrittlement, loss of tensile strength, and delamination. Accelerated testers provide fast and reproducible results. The most frequently used accelerated weathering testers are the fluorescent UV accelerated weathering tester and the xenon arc test chamber. This paper compares two accelerated weathering test methods: fluorescent ultraviolet and xenon arc, and describe the strengths and limitations for both techniques.

Large Part Thermoforming

SESSION MODERATORS
Ed Bearse, General Motors;
David Okonski, General Motors R&D

Improved Scratch Whitening for Thick Gauge, Low Gloss, Mold In Color Thermoforming Applications

Kip Swain, Mytex Polymers

High Melt Strength (HMS) thermoplastic olefins (TPO) were developed for key material properties: melt strength, flexural modulus, cold temperature impact, coefficient of thermal expansion (CLTE) as an alternative to engineered resins. Most HMS TPOs have poor scratch performances, an alternative solution for poor scratch unfilled "high gloss" co-extruded cap layers that are popular for the elimination of paintable processes, but have limited use for low gloss, molded in color (MIC) applications. This paper describes the development of an improved scratch whitening cap layer for "Low Gloss, Thick Gauge, MIC, Thermoforming Applications" and draws scratch performance correlations between injection molded, extruded, and thermoformed parts.

Solarkote® Acrylic Capstocks for TPO

Thomas Richards, Arkema Inc.

Acrylic resins provide surfacing solutions allowing the use of ABS and HIPS in demanding outdoor applications by providing the weatherability and surface properties of acrylic. To expand the use of TPO in thermoforming applications it is necessary to match the level of gloss, scratch resistance and DOI provided by an acrylic capstock. Our system meets this need by combining the surface properties of acrylic with the impact resistance of TPO. This presentation will discuss the improved physical properties that can be achieved by taking advantage of the most recent product in the Solarkote® family.

Thermoformed Application of TPO for the Ford F-250 LPG Tank Cover Program

Craig Abernethy, Mytex Polymers

This presentation will discuss the program/application needs for a quick turnaround project to create a plastic cover for a natural gas tank on Ford trucks. With gas prices remaining high, retro-fitting truck with natural gas tanks has increased with new models. This presentation will go into key material properties needed for manufacturing, part performance, and future direction to improve designs in the future.

TPO use in the Heavy Truck Industry

Roger Jean, Premier Material Concepts

This presentation will highlight examples of TPO used by various process methods in the Heavy Truck industry. Heavy Truck classification will be reviewed along with the various interior, exterior, and underhood applications used by the industry. Major Heavy Truck OEMs, market dynamics, material trends, and the similarities to the automotive industry will be discussed.

New Developments in Flame Retardant Thermoplastic Polyolefin (TPO) Compounds Suitable for Extrusion-Thermoforming Applications

Sunit Shah, LyondellBasell

As thermoplastic polyolefin (TPO) compounds in thermoformed parts find increasing applications in the automotive and transportation industry, there is a growing need for materials that exhibit an enhanced level of flame retardancy. TPOs in these applications benefit from their superior attributes, including low temperature impact resistance, ease of recyclability, chemical resistance inherent with polyolefins, weatherability and potential for weight savings. This paper emphasizes the characteristics of a new flame retardant TPO material designed for thick-sheet thermoforming. Discussed are physical properties, processability, and flame retardant performance.

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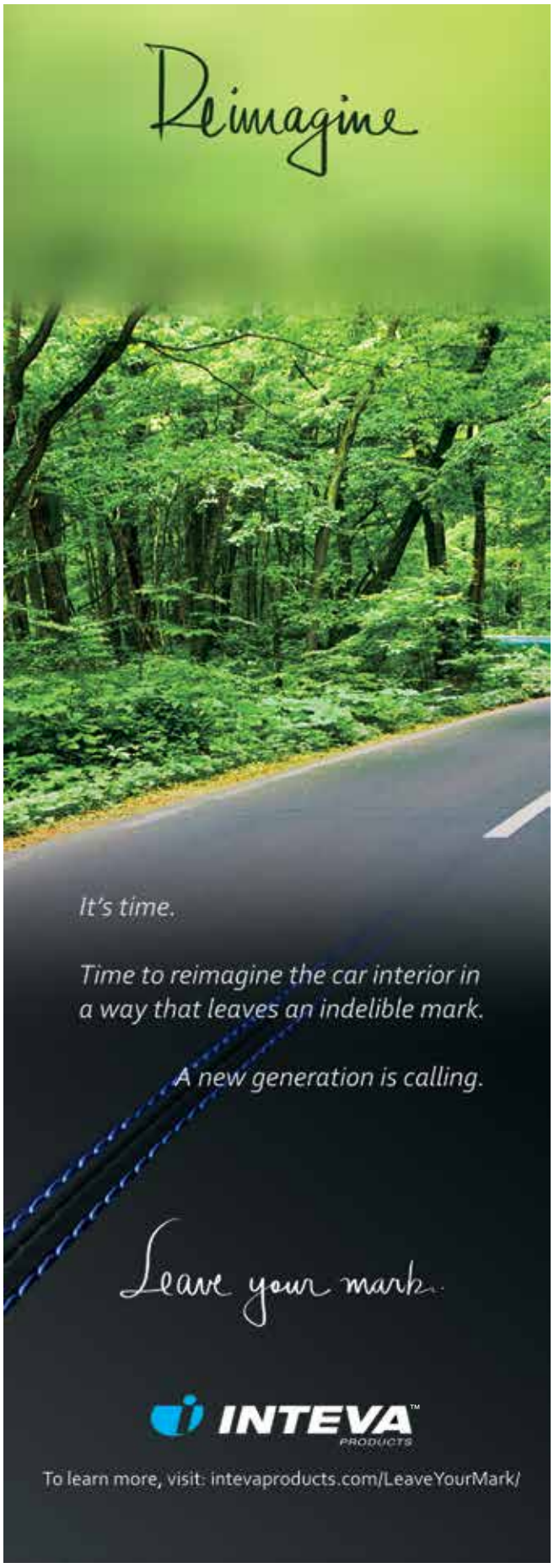

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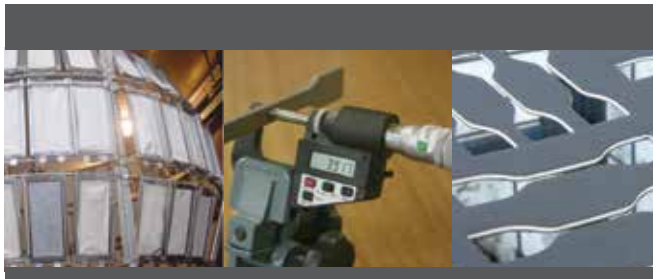

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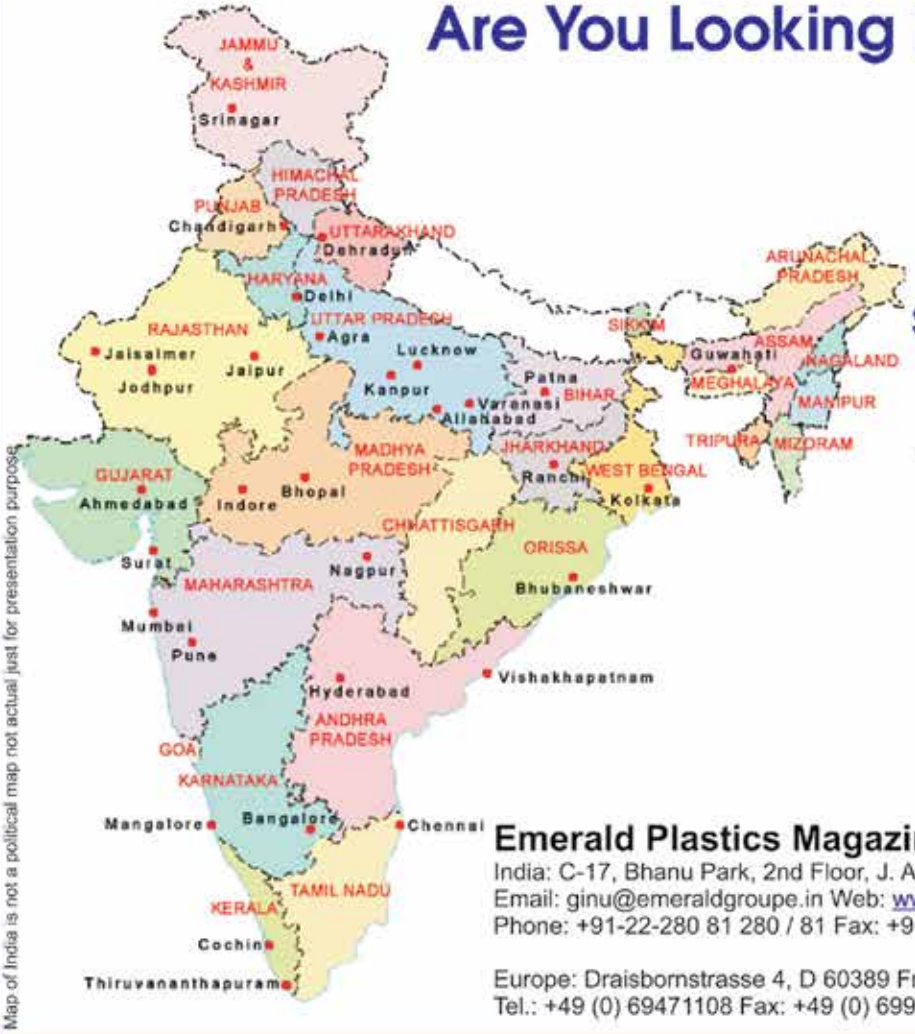

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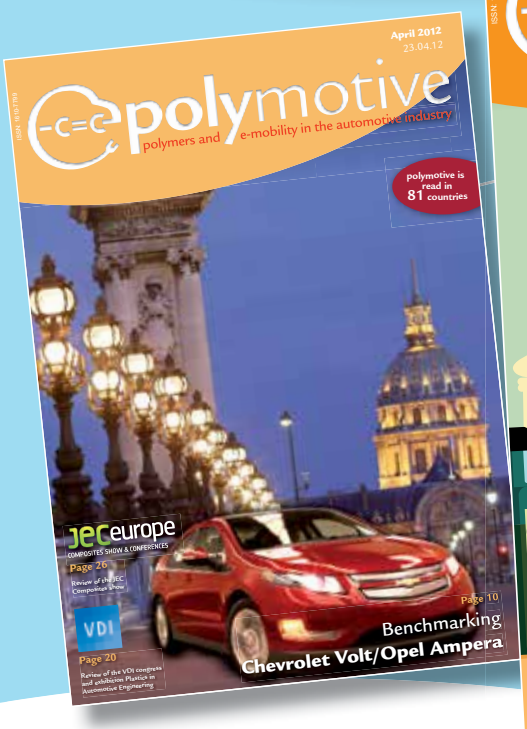

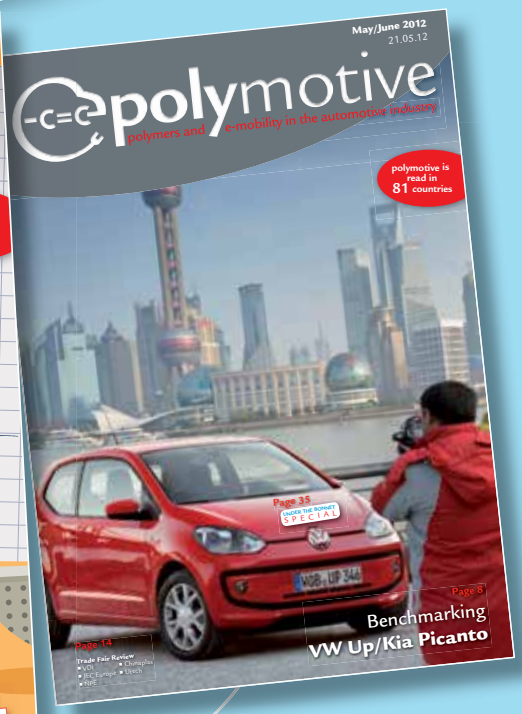

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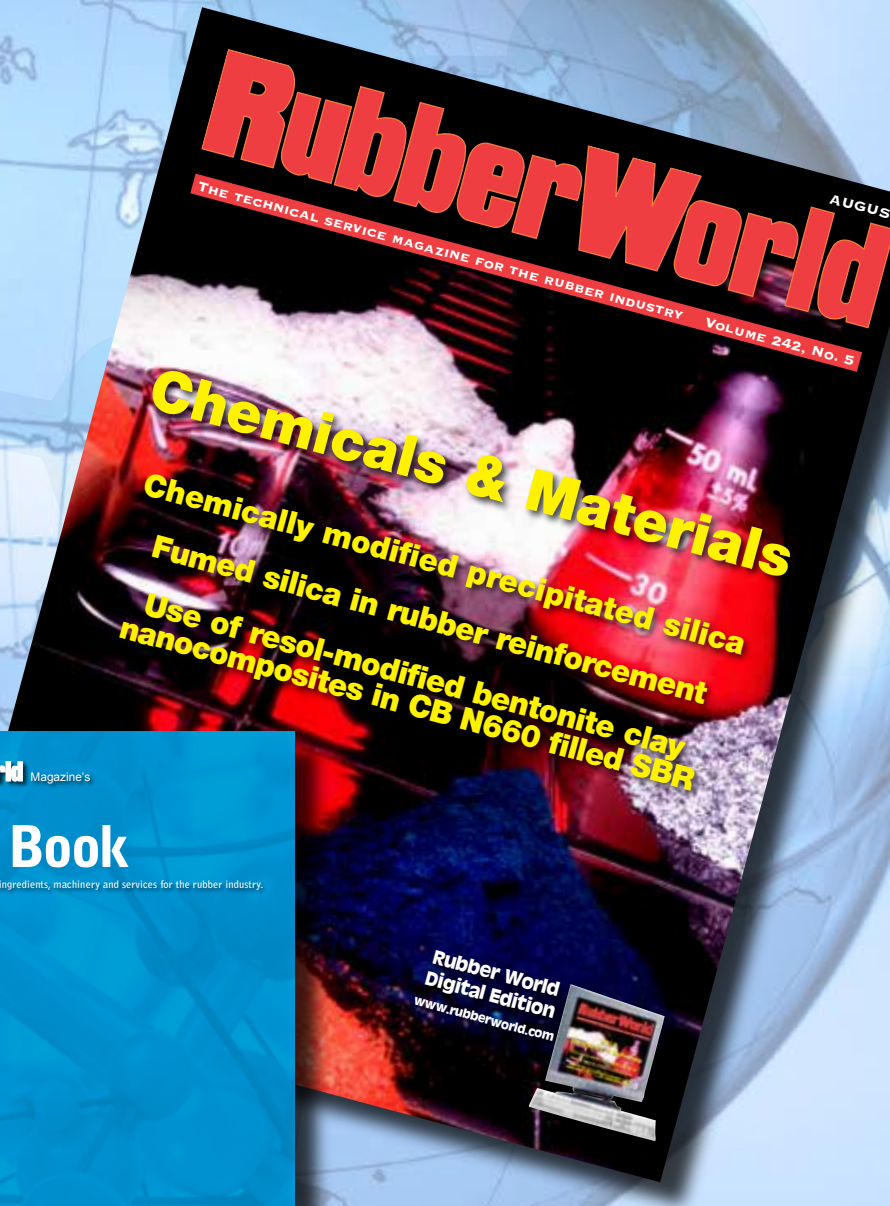

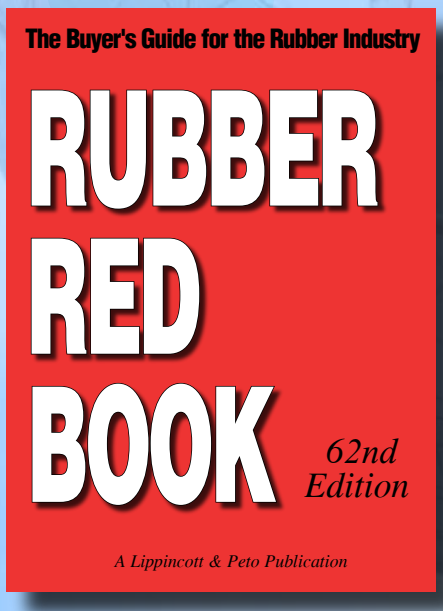

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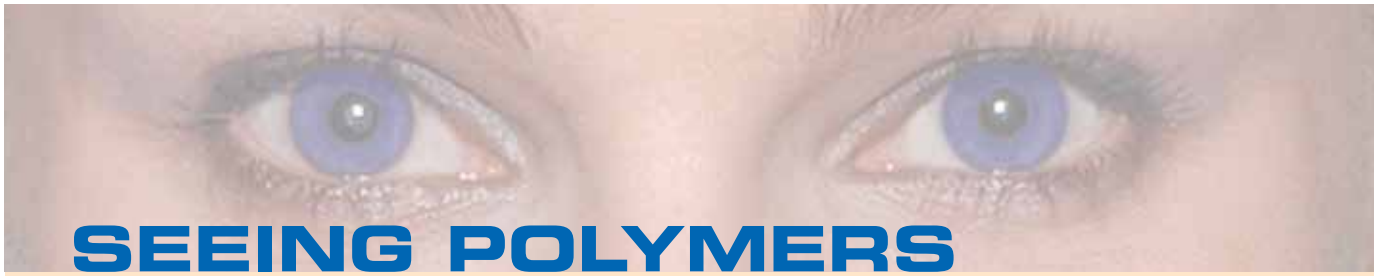

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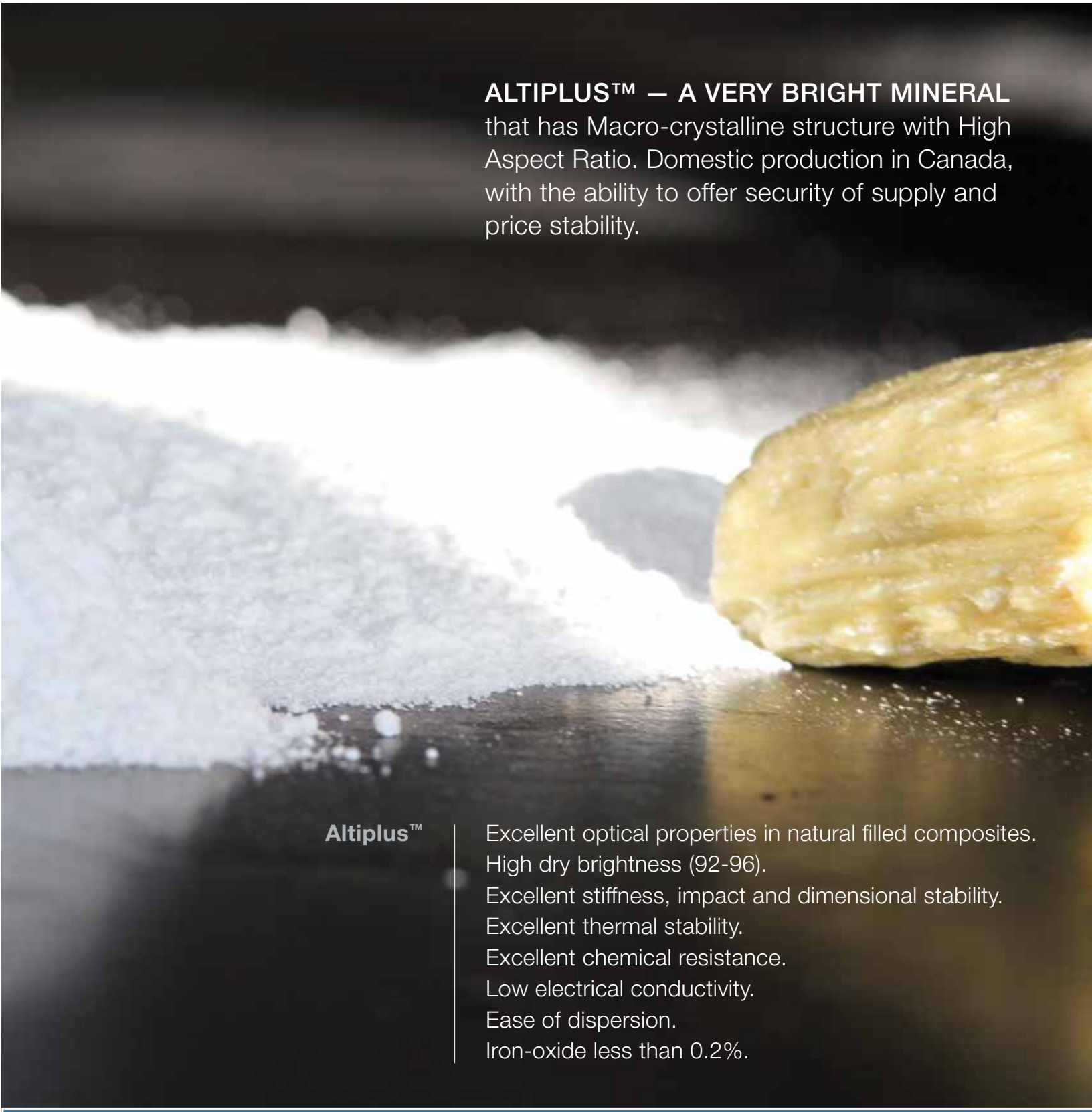

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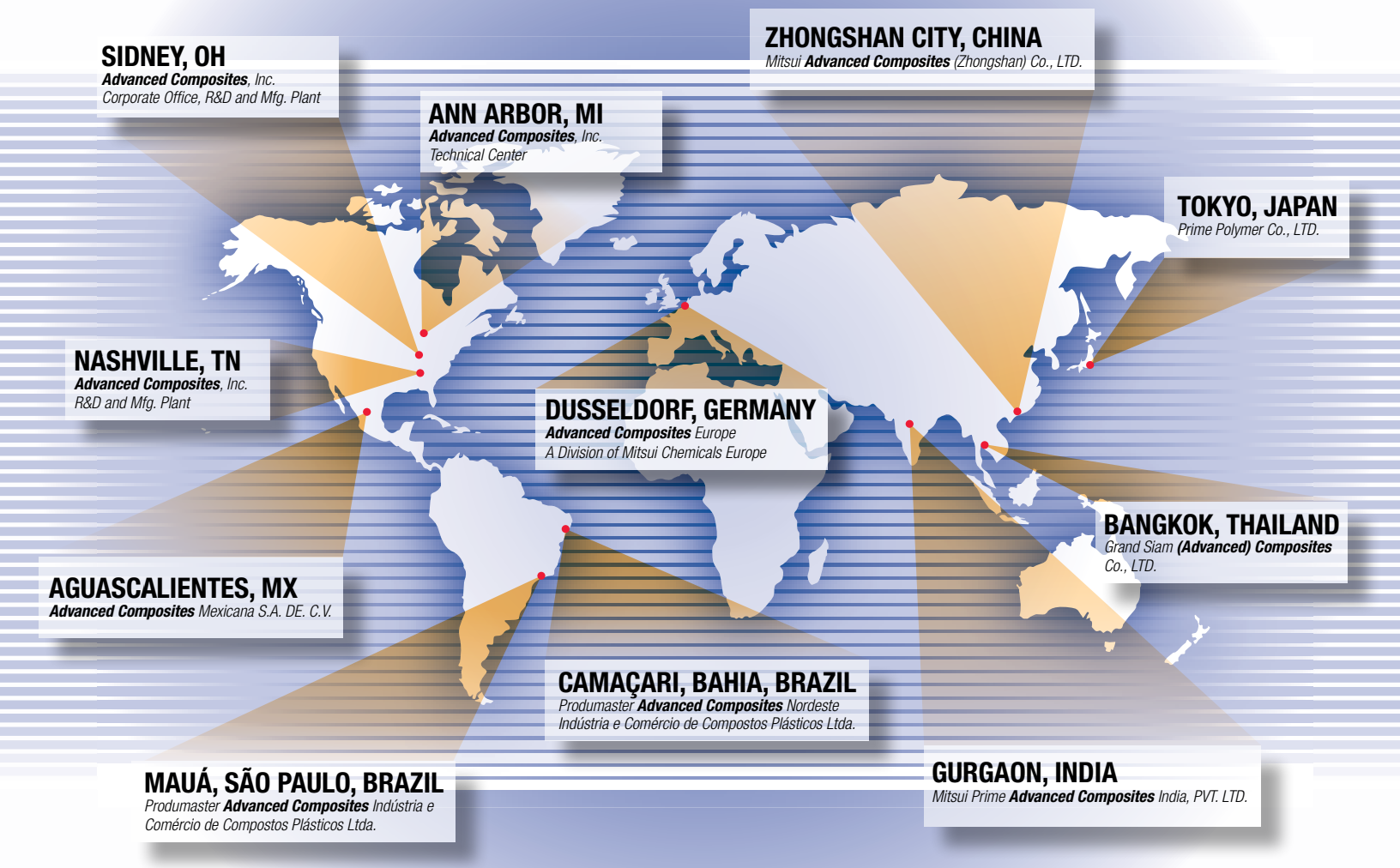

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