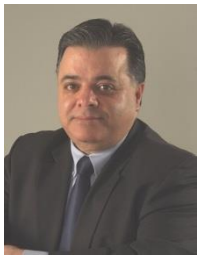
Materials Development Session



Advanced reactive based compounded materials for Interior, exterior and underhood applications

Dr. Sassan Tarahomi, Chief Technology Officer, Alterra Holdings

Demanding automotive applications require development of advanced reactive based compounded materials. This was result of listening to the customer voice which can be a great guiding light for your material development team. Future autonomous or electric vehicles require tougher, lighter and lower cost material for their exterior, Underhood or interior.

Injection Molded High Gloss Black TPO for Automotive Exterior Applications

Quentin Boll, Product Development Engineer, LyondellBasell

High Gloss Black, also known as “Piano Black”, is an actively sought-after finish for exterior trim applications on modern automotive vehicles. Currently, this finish is achieved by use of an engineered resin or an injection molded substrate that is painted or wrapped. The development of this High Gloss Black TPO offers significant cost savings via ease in manufacturability, improved processing flexibility, part durability, as well as substantial decrease in part weight compared to the incumbent.

Low emission and sustainable TPE for Interior Soft-Touch innovations

Dr. Thomas Köppl, Group Product Manager, HEXPOL TPE

Requirements for automotive TPEs continue to increase, especially in the areas of interior air quality, haptics, abrasion resistance, cleanability and sustainability. This paper will cover the contribution made by TPE’s to odour, fogging and VOC’s in the passenger compartment and introduce newly developed TPE compounds from HEXPOL TPE which reduce emissions on average by 75%, enabling one to easily meet the emissions requirements of OEMs today as well as address future increasing requirements.

Meeting Tomorrow’s TPO Performance Requirements with Next Generation Polyolefin Elastomers

Mark Jablonka, Product Technology Leader, Dow

Polyolefin elastomers are a key component of automotive TPOs, enabling a variety of final part application performance targets to be met. Over the years Dow has developed numerous grades of polyolefin elastomers enabling expansion of the application space for TPOs. This work will highlight Dow’s latest developments in the polyolefin elastomer area and how TPO performance differentiation can be achieved with next generation polyolefin elastomers.

Innovative SEBS for improving the properties of TPEs and engineering plastics for automotive parts

Sherry Takagi, Sales Manager, 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, modified grades which are suitable for enhancing the functionality of engineering plastics (i.e. PA, TPU, PPS)

SK Global Chemical High Performance Polypropylenes and Polyolefin Elastomers for Sustainable Solutions for the Automotive Industry

Dr. Fanny Deplace, Senior Leader, SK Global Chemical

SKGC offers a range of polymers and solutions for the automotive and packaging industries. In the area of TPO, SKGC continues to develop advanced and innovative polypropylenes and elastomers. The high crystallinity and impact strength of SKGC polypropylenes combined with high performance polyolefin elastomers allow compounders to optimize their TPO recipes to create environmentally friendly and safe products. A wide range of properties can be achieved from the myriad polypropylene/elastomer combinations that SKGC offers.

New styrenic block-copolymer impact modifiers for TPO compounds

Dr. Amit Desai, Scientist, Kraton

We report development of styrenic block copolymers to increase the compatibility of the block copolymers with polyolefinic elastomer and polypropylene in order to improve the impact resistance of TPO compounds. These new polymers led to an increase in impact strength compared to existing formulation without significantly affecting other physical properties. These new impact modifiers can enable the use of TPO compounds in new applications demanding higher performance, such as thin-walled and low-density parts.

Extending the Value of Polypropylene Composites filled with Glass Fiber/Talc via Superior Additive Technologies

Kenji Yamashita, Product Manager, ADEKA Corporation

Engineering plastics and metals have been extensively replaced by polypropylene based materials in automotive parts to achieve both weight reduction and cost savings. GF-PP and Talc-filled PP are already being used in this application, but further property improvements of the composites are still necessary. This paper mainly describes the effects of advanced nucleating agents in GF-PP/Talc-filled PP such as improvement in mechanical properties, heat distortion characteristics and anisotropy.

High Stiffness and High Impact Glass Filled Polypropylene with Improved Heat and Chemical Stability

Dr. Lily Liu, R&D Engineer, PolyOne Corporation

In response to the high demand on lightweighting in the automotive industry, various reinforced polypropylene solutions have been explored and developed. Properties of filled polypropylene which have been greatly improved include stiffness, impact strength, higher fluidity and heat and chemical resistance. In this paper, we will discuss the development of PolyOne's short-glass-fiber reinforced polypropylene which provides enhanced stiffness and impact properties, along with excellent heat and chemical stability.

Environmentally friendly applications of talc in automotive polyolefins

Piergiovanni Ercoli Malacari, Product & Application Development Manager, IMIFabi Spa

In this paper, different solutions in using talc for lightweighting will be presented, including polyolefin foaming where talc plays an active role as bubble growth nucleator. Some polyolefin recycling strategies will be presented too, showing how to optimize the final recycled formulation to achieve best final properties, suitable for automotive. A responsible usage of natural resources is promoted as well.

Advanced UV and Thermal Stabilizer Solution for Enhancing Durability of Automotive TPO

Dr. Kyle O'Connor, Research Scientist, Solvay Polymer Additives

The need for automotive TPOs to have combined UV and thermal protection without compatibility, odor, or VOC issues contributed by the additive package is critical. There have been many efforts across the industry to develop additive technologies for TPO to endure harsh UV and thermal environments. Today, this paper discusses a new stabilizer solution capable of providing both UV and thermal protection, extending the performance and opening additional high value opportunities for automotive TPO.

Latest stabilization solutions for automotive TPO compounds

Emilie Meddah, Technical Marketing Manager, Clariant

In the past few years started a race for performances in polymer compounds for automotive applications. Lighter, stronger, more durable, easy to clean, better aesthetics, comfort, more sustainable, less smell, healthier, are some of the requirements expressed by the OEMS. This stringency is making new plastic compounds developments more and more demanding and challenging. Clariant Performance Additives, specialized in polymer stabilization, is introducing new solutions which fulfil current performances requested by the OEMs and beyond.

A Developed Antioxidant Formula that Improves Color and Melt Index Compared with Conventional Blends

David Chui, Market Manager, FDC Lees Co.

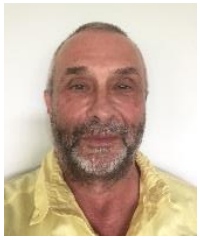
Olefin-base polymers are very commonly used but are susceptible to discoloration and loss of mechanical properties due to oxidative degradation during the manufacturing process. Conventional antioxidants may have limitations such as yellowing and reduced processing stability in polyolefins. With the aid of an anti-acid agent, a new formula has shown an improvement in performance over conventional blends in terms of yellowness index, b* and melt flow index.

Permanent Ion Conductive Anti-statics in TPOs

Dr. Emile Homsi, Research and Technology Manager, Croda

Driven by the increasing number of electronics, electronic components and sensors in modern vehicles, the demand for surface resistivity to repel dust on instrument panels and consoles has been a challenge for the automotive industry. We will discuss how inherently static dissipative polymers (IDP) differ from traditional antistat and conductive particle/fiber technology, allowing for a permanent

solution for dust repellency on sensitive TPO components. These permanent antistats will enable charge mobility and control of static without controlled dissipation of charge imbalance to ensure optimal ESD safety and maintain static dissipative properties throughout the life cycle of plastic automotive interiors.



Highly Efficient and Innovative Halogen Free Flame-Retardant Solution for Polyolefin Materials

Dr. Gary Rex, Technical Sales Consultant, Hangzhou JLS Chemical Fire Retardant Co.

Polyolefins have a low Limiting Oxygen Index (LOI) and therefore flame-retardant (FR) modification is necessary. This paper explains the intumescent FR (IFR) mechanism and introduces both an improved IFR powder and masterbatch concentrate based on the same IFR. FR data obtained show a low peak heat release, low smoke density coupled with low toxicity in both reinforced and non-reinforced polyolefins.

Sustainable Stabilization Solutions that Address Latest Automotive Trends

Thomas SantaMaria, Technical Service Chemist, Solvay Polymer Additives

New trends in the automotive industry require solutions with innovative aesthetics and functionalities. Consumers are demanding vehicles with bright, dazzling metallic effects and ride sharing is becoming increasingly popular requiring improvements in cleanness and odor. In this presentation, Solvay will share recent advances in its high-performance sustainable UV stabilizers that allow metallic pigment to replace the metallic painting process reducing VOCs and enabling healthier car sharing by enhancing the stabilization of antimicrobial surfaces.

New Novel Odor Detection Method

Dr. Laura Shereda, Polymer Scientist, Asahi Kasei

Using the NeOse, developed by an Asahi Kasei sister company, we have been able to detect odor in polypropylene compounds. This method allows us to compare a “chemical fingerprint” of different samples to one another and also to understand relative intensity from sample to sample. These results will be presented in this paper.

Benefit of Long Chain Branched PP (LCB) for Foam Molding

Dr. Kenji Masuda, Group Leader, Japan Polypropylene Company
CK Yoon, Material Development Manager, Mytex US Corp

Automotive weight reduction is demanded for better fuel efficiency which is regulated for environmental concern and foam molding can be one of the solutions to make plastic parts lighter. JPP's New Long Chain branched polypropylene (LCB-PP) provide significant improvements in foam molding. LCB-PP can be incorporated into standard PP as modifier to improve foaming expansion ratio, cell morphology and mechanical properties.

Engineering Heterophasic copolymer Polypropylene (Impact Copolymer PP): Super flow and Super toughness ICP for automotive compounding

K.K. Vimal, Research Manager, Indian Oil Corporation Limited

Indian Oil, with its patent pending process, is able to produce ICP with very high MFI of 100 g/10 min having no-break impact strength and a balanced flexural modulus of 750-1200 MPa. This is achieved by a simple route of tailoring the molecular architecture of polymer after polymerization in an extruder. In this process no additional filler or elastomer is added. These resins also have shown very good low temperature impact performance equivalent to reactor made TPO.

An Additive Approach to Tailored Melt Strength in PP and TPO

Brett Robb, Applications Chemist, TOTAL Cray Valley

Polypropylene is a semi-crystalline polymer with low melt strength. HMS-PP is often used to overcome this deficiency. Adding Dymalink 9200 into PP creates a unique dynamic network leading to unusually high melt strength behavior even at very low loadings. This allows for a tailored approach to high melt strength in PP-based homopolymers, copolymers, and elastomers that are used in injection molding, thermoforming, and foaming applications. Additionally the boost in melt strength allows for increased incorporation of regrind into these processes.

Additive Manufacturing (3D Printing) Session

Simulation Driven Design for Additive Manufacturing: Opportunities for the Entire Supply Chain

Ravi Kunju, SVP, Business Development & Strategy, Altair

Additive Manufacturing (AM) brings promise of design freedom, accelerated product development, customization and part consolidation; opening doors for the entire supply chain with opportunities to improve efficiencies and product performance. A Simulation driven, generative design methods like topology and topography optimization can automatically create lightweight and efficient structures, that are manufacturable (constraints) to meet complex set of performance requirements. The presentation will help lay out an effective and repeatable product design strategy using compelling examples.

Digital Texturing Techniques for Automotive 3D Print

Alex Ju, CMF Designer, Automotive Applications, HP Inc.

Futuristic vehicles warrant futuristic aesthetics. Additive manufacturing enables exactly that through the streamlined production of parts with innovative, integrated textures. We have been developing digital workflows for the creation and application of such novel textures to 3D-printed plastic parts for automotive applications. We also evaluate the intersection of texture design with material selection and final finishing techniques, addressing the impact of gloss level on the visual and tactile impact of final textured parts.

3 D Printed Prototype Parts out of Production Material in Single or Multi Component Technology

Trevor Pruden, Technical/Engineering Manager, ARBURG, Inc.

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.

Polyolefins in Powder Bed Fusion Additive Manufacturing

Michelle Sing, Ph.D., Technology Development Engineer, Braskem

While it has been around for decades, recent technological advances have increased the prominence of Additive Manufacturing (AM) as an alternative processing technique for polymeric materials. While there has been a surge of innovation surrounding the ability to make AM technologies industrially relevant, the materials portfolios corresponding to the different AM processes have largely remained limited. Braskem has been working to design printable polyolefins and help expand the materials space in AM.

Utilizing Conformal Cooling in Injection Molding

John Tenbusch, CEO, Linear AMS

Conformal Cooling is the optimization of cooling or heating channels that follow the shape of the molded part for productivity and quality improvements. Utilizing DMLM to additively manufacture the insert, the freedom of design allows for lines to be placed an optimal distance from the surface. Conformal Cooling offers a solution to increased cycle times by reaching areas of the part that have hot or cold spots to help control part temperature during molding-minimizing cooling time, scrap, and warpage.

Numerical Simulation of Warpage for Thermoplastic Parts in Fused Filament Fabrication (FFF) Process

Dr. Danielle Zeng, Technical Specialist, Ford Motor Company

Additive manufacturing is a growing technology due to its ability to fabricate parts with complex geometries. One of the most common issues in AM process is the warp of the parts. In this work, a new integrated method is developed to model the FFF process and predict the plastic part warpage under different process conditions. The prediction results are compared to the measurement data to demonstrate the accuracy and efficiency of the simulation model.

Composite Based Additive Manufacturing (CBAM) 3D Technology

Jeff DeGrange, Chief Commercial Officer, Impossible Objects Inc.

TThe presentation will provide a detailed look into Impossible Objects Composite Based Additive Manufacturing (CBAM) technology that uses nonwoven composite sheets and thermoplastics to produce 3D Polymer Matrix Composite (PMC) parts. This will include an in-depth material and process discussion into the material combinations, fiber volume, void content and resulting material properties.

Interior Applications & Laminating Adhesives Session

Autonomous Vehicles, Car sharing and Electric Vehicles Are Driving Smart Applications and TPOs/TPEs will benefit

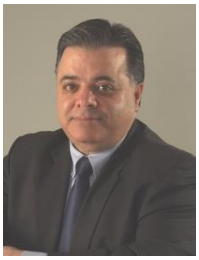
Bob Eller, Robert Eller Associates LLC

Automotive interior functions are at an inflection point with respect to design/performance requirements and fabrication process technologies. TPOs, TPEs and PP compounds as well as the supply chain are evolving to meet the new requirements. A new generation of smart materials is evolving to broaden the capabilities of interior components. This paper will examine implications of this evolution for components such as IP/door trim skins, acoustic components, lightweighting targets and foams.

TPO Advances for Interior Applications

Jason Fincher, Material Development Manager, Advanced Composites

Three continuing needs for interior TPO materials are processability, weight reduction, and suitability for safety applications. Advanced Composites has developed materials that meet these needs by providing increased flowability for improved processability while maintaining cold temperature ductility for safety. These materials also provide opportunities for reduced weight. This presentation will characterize the overall performance of these novel materials relative to incumbent TPO.



Advanced TPO and TPE materials for the interior of Autonomous and Electric Vehicles

Dr. Sassan Tarahomi, Chief Technology Officer, Alterra Holdings

Vehicle development is changing dramatically due to changes in vehicle design, power system and driver needs. Automotive OEM will be designing lighter vehicles with roomier interior, feeling and looking as an extension of our home, office and a place to relax in complete silence. The radical change of vehicle usage from a simple transportation to a complex human habitat with multidimensional application on wheel would require Advanced interior material.

Advancements of the Kraton™ IMSS Technology for Automotive Interiors

Dr. Amit Desai, Scientist, Kraton

Kraton™ Injection Molding Soft Skin (IMSS) technology enables the injection molding of large, thin-walled soft skin parts, which allows significant cost-saving over existing technologies, supports light weighting initiatives in automotive and provides a low odor/VOC alternative. Here, we will discuss further progress of the technology, specifically related to improving aesthetics and weatherability. These enhancements will assist in enabling the technology to obtain OEM specification approvals above and beyond those achieved to date.

TPO Acoustics Absorbers for Hybrid and Electric Vehicles

Ali Khosroshahi, Michael Demo, Freudenberg Performance Materials LP

A quiet ride has always been the goal in advanced automotive designs. Since automotive noise covers a wide range of frequencies, designers have used various materials to reduce the noise level in the vehicle. With the increased demand for reducing the vehicle weight, nonwoven fabrics have made inroads into different automotive applications, including acoustics. A nonwoven TPO material was developed to address noise reduction in hybrid and electric vehicles.

Thermoplastic Elastomers (TPE) for Automotive Interior Applications

Juan Espinosa, Steve Cranney, Kraiburg TPE

TPEs are used to produce a variety of automotive interior components such as mats, gaskets, cup holders, etc. Some are stand-alone molded articles, others are overmolded onto various substrates. With increasing consciousness on health and safety, emissions and odor of the interior components have become of great concern. Kraiburg-TPE studied both the effect of each separate raw material and the influence of the manufacturing process on the overall emissions and odor of multiple TPE formulations.

Introduction of Functionalized Air Bag Cover Thermoplastic Elastomers (TPEs)

Hitoshi Kageyama, Sumitomo Chemicals Co., Ltd

tFor airbag cover applications, appropriate MFR, stiffness and impact strength at low temperature are mandatory properties. Our TPEs, ESPOLEX series, fulfill the properties as well as the other unique characteristics to fit customer's needs. As an example, excellent aesthetic surface appearance and its concept are going to be introduced.

TPO foam

High Performance Reactive Hot Melt Adhesives for PVC - skins

Dr. Martin Weller, H. B. Fuller Adhesives Deutschland

Increasing standards for interior trim part durability create the need for RHM (reactive hot melt) adhesives with high heat and hydrolysis resistance and enhanced plasticizer resistance. PVC and TPO foil-backed foams with PVC foam, while commonly used, remain challenging substrates due to their shape memory and plasticizer content. Quality laminations require adhesives that meet these new requirements. New RHM technology and products enable manufacturers to meet this challenge while maintaining or improving safety and productivity.

TPO Frame for Acoustic Parts

Meagan Marko, Noble Polymers, LLC

Lighter noise treatments that do not sacrifice acoustic performance are desired by automakers for fuel efficiency. This can be accomplished with very light layered fiber silencers. Die-cutting the fiber layers can provide light density, but not part shape. A TPO flexible frame provides necessary shape with an easily adjustable balance of stiffness and flexibility to allow assembly into the front of dash body. This construction provides a weight savings, cost savings, and better acoustic performance.

SRD-5219: Pre-Applied Waterbased Adhesive for Automotive Interior Applications

Jessica Gunder, Sunstar Engineering Americas

Sunstar has developed a waterborne adhesive that can pre-applied to polyolefin foam blends and untreated polypropylene substrates. It provides quick drying times, excellent strength, low activation temperatures and extended shelf life of pre-applied materials. The adhesive can be coated at the laminate supplier, therefore eliminating the need to apply and dry the adhesive on site. The interior part producer will only need to heat the foam through normal vacuum forming process.

Making Luxurious Automotive Interiors More Accessible for All Types of Vehicles with Soft-feel PP Compounds

Dr. Zahra Fahimi, SABIC

Consumers today demand luxurious haptics and finishes for their interiors – even in lower-priced vehicles. How can automakers satisfy this demand, while managing costs? This session will highlight the chemistry behind one solution – a polypropylene compound, which can deliver a soft, comfortable feel and excellent scratch performance for unpainted, low-gloss automotive interior components. This same solution, which requires only one high-volume injection molding step, eliminates the need for costly secondary operations.

Metal Rear Injection for Decorative Automotive Interior Surfaces

Jeff Bailey, Nolax AG

Today's automotive design initiatives are focused on making the car more stylish, luxurious, and durable for the consumer. One approach to meet these desires is through the use of "authentic" materials, such as real metal surfaces. This presentation will review film adhesive options that enable the metal rear injection molding process, which combines metal decorative surfaces with plastic injection attachment features.

Process Developments Session

Weight Reduction of Plastic Components by using Modern Technology

Trevor Pruden, Technical/Engineering Manager, ARBURG, Inc.

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.

Flexible Injection Molding Solutions for the Integration of Functional Films

Jason Holbrook, Sales Manager, Krauss Maffei Corporation

With a single mobile compact production system, a 10-inch HMI with integrated electronics, decorative frame and scratchproof coating can be created with IML film printed conductors on the nozzle side inserted into the mold. Single-image IMD film then runs through the ejector-side mold, transferring its painted design layer and UV-top coat to the plastic surface while another film runs through the mold providing a second-cavity décor for surface aesthetics, which allows backlit revealed operating symbols.

Composite Hybrid Reinforcements in Tailgates: A Feasible Solution for Mass Production?

Dinesh Munjurulimana, Senior Scientist, Global Technology Automotive Petrochemicals, Sabic

Weight reduction is a key driver to meet increasingly stringent emissions legislation, improve fuel efficiency and increase the range of electric vehicles. This paper presents novel design for a composite reinforced lightweight LGFPP inner tailgate structure that could be a viable, and mass-producible concept. Optimal performance at the lowest weight and cost is achieved by selective application of glass reinforced UD-laminate inserts and numerically optimization. Functional integration is applied to ensure acceptable total system cost.

Flow-Line Defect Analysis for a Thermoplastic Polyolefin

David Okonski, Staff Research Engineer, General Motors

The author first encountered flow-line defect while launching the fascia tools for the Chevrolet Corvette in May of 2013. Flow-line defect resulted in a very noticeable blemish on the painted surface of a TPO part and was believed to be the result of localized variations in the stress state of contiguous materials. The work presented here will cover the recent progress that has been made in further defining and understanding the root-cause of flow-line defect.

Knit-Line Defect Analysis for a Thermoplastic Polyolefin

David Okonski, Staff Research Engineer, General Motors

Knit–lines (both weld and meld) are created when a plastic flows around an obstruction used to create some geometric feature necessary for the implementation of the part. In the work presented here a four factor, sixteen run DOE was used to study the effects of melt temperature, mold temperature, pack pressure, and fill time on the appearance and strength of a knit-line formed by flowing a TPO melt around core pins of different diameter.

Enhanced Screw Element Designs for Improved Throughput and Quality of Highly Filled Polyolefins

Paul G. Andersen, Process Technology Consultant, Coperion Corporation

Co-rotating twin-screw extruders have evolved significantly since being developed. However, kneading blocks have remained essentially the same. To benefit from increased torque capacity of the latest generation compounders, solids conveying and melt/mixing capacity needed improvement. Coperion has developed kneading elements with novel involute cross-section geometry to achieve this objective. This presentation provides comparisons of standard vs. involute kneading elements, specifically looking at some significant aspects related to increased productivity and quality of highly filled polyolefins.

Reducing Inspection Based on Data Driven Results from Design of Experiments (DOE)

Suhas Kulkarni, President, FIMMTECH Inc.

Design of Experiments is a tool that been used for several decades. However, molders shy away from using the tool because of the misconception that it takes a lot of time and effort to perform the experiments and analyze the data. The talk will focus on the application of DOEs to Injection Molding and how the analyzed data will help reduce inspection during regular production.

Optimized Extrusion Process for Developing High Performance & Lightweight TPO's

Dr. Tanmay J Pathak, Product Application Development, LyondellBasell

The work presented here focusses on the development of a low density, mineral filled polypropylene composite that exhibits a great balance of properties with high stiffness as well as impact, highly desirable in automotive applications. This was achieved by a balanced formulation approach, but more so with an improved process design on twin screw extruder. The improved extrusion process also helped to convert batch process TPOs to continuous TSE process while enhancing the product properties.

Ultrasonic Welding of Thermoplastic Olefins (TPO's)

Dr. Jane Lu, Product Application Development, LyondellBasell

Ultrasonic welding is one of the most commonly used technique for welding the thermoplastic olefins (TPOs) parts in the automotive industry. LyondellBasell has conducted a comprehensive study on evaluating the factors contributing to the weld quality. This presentation will be focused on how the welding parameters and material properties affect the welding strength and read through on the painted TPO surface for bumper applications.

Numerical Case Study Assessing Key Factors of Foaming Ability in Injection Molded Parts

Alex Baker, Applications Engineer, Moldex3D N.A., Inc.

Lightweighting is a growing need in a world where speed and efficiency are key. Foaming in plastics materials displaces the plastic with gas bubbles to reduce part weight and makes the part more dimensionally stable; a win-win scenario for quality assurance. Evaluating the distribution of foaming throughout the part gives us an idea of material property consistency and distribution of pressure due to the foaming phenomenon.

Plastic Processing Solutions using Integrated Infrared Thermal Machine Vision

Chris Lemmons, Executive Sales Manager, Emitted Energy Corporation

Failure to meet heating and cooling requirements often leads to costly process faults. Our solutions help you as they automatically correct these failures in every thermal process. From Component Manufacturing to Complete Assembly and Performance Testing, we help you automatically analyze the thermal profile of any part or process. Thermal Machine Vision Solutions are deployed to increase throughput, improve part and process quality, reduce scrap, allow labor to be reallocated, and prevent machine downtime.

Improved PP LGF for Aesthetic Parts

Tony Samurkas, Director, Technical Service & Development North America, Trinseo Performance Plastics

New liftgate designs require PP LGF materials with extremely consistent fiber dispersion and color due to the part having an interior show surface. Our recently developed ENLITE™ PP LGF grades have excellent fiber wet-out and dispersion, resulting in Class A aesthetics. We will review these new materials with examples of the improvements achieved and of applications where they have been successfully implemented.

Lightweighting of Plastic Parts Session

Lightweighting Solutions in filled Polypropylene Systems

Lily Liu, PhD, Lead R&D Engineer Polyone

Nowadays, people are focusing more on circular economy to keep the resources in use as long as possible, to extract the maximum value, and to reduce waste. One of the most preferred approaches from manufacturing is to use less initial material. Such approach, called lightweighting, is especially popular in the automotive industry. In this paper, we will introduce PolyOne's lightweighting solutions in various filled polypropylene systems.

Innovative solutions for maintaining aesthetics while creating light weight polyolefin and TPO Applications

Luca Gazzola, R&D Polyolefins Manager, Sirmax S.p.A

Creating visually aesthetic Class A surfaces through the use of a new generation of lightweight materials requires a multi-pronged approach. Various combinations of performance polymers along with special fillers including talc and glass products are considered based upon the end use. Unique Customer design considerations drive the R&D process to the formulation and localization of available raw materials with controlled interactions.

Carbon fibre demand forecast and recycling challenges

Markus Kralicek, Business Development Manager, IC Automotive, Borealis

Driven by the need for lightweighting, carbon fiber growth brings with it significant challenges, in particular in the areas of resource intensive production and disposal. Borealis took on these challenges and developed Fibremod™ Carbon – a new generation of Carbon Fiber reinforced Polypropylene materials, creating additional weight savings and down gauging opportunities for Automotive parts. Several case studies, illustrating the variety of possibilities offered with this new generation of materials will be discussed in the presentation.

Fibre Reinforced Polyolefin Materials for Lightweight Constructions

Herald Herbst, Business Development Manager, Borealis

Fibre reinforced materials, prominent in Automotive lightweight constructions, require formulations adapted to the characteristics of the polypropylene matrix, the type of fibre and the fibre amount. Application engineering requires advanced methods integrating material recipes, conversion processes and details of the application testing. This paper discusses the theoretical background of fibre reinforced polyolefin materials (PPGF, PPLGF and PPCF), special lab methodologies required, and illustrative examples where Integrative Modelling techniques are successfully applied.

Advances in Lightweight PP Materials Enabled by 3M Glass Bubbles

Eric Labelle, Business Development Manager, 3M Company

Adding high strength hollow glass microspheres to thermoplastics brings lightweighting, productivity, and dimensional stability benefits. 3M's iM16K grade microspheres, with its unique ultra-high strength-to-density can enable lightweight PP compounds that confidently survive typical polymer processing. 3M iM16K glass bubbles can enable PP compounds that achieve an attractive mix of weight savings (~15%), retained properties, and a worthwhile business case in execution. This presentation will highlight usage of iM16K microspheres in PP compounds and potential applications.

High performance light-weighting polyolefins replacing engineered plastics

Mr. Hideaki Nishio Automotive Marketing Director, Sumika Polymers NA
Mr. Nicolas Schlutig, Technical Manager, Sumika Polymer Compounds, France

High performance glass filled low density polypropylene materials technology has been developed that successfully replaces engineered resins and metals in the automotive applications. Unique polypropylene, coupling agents and processing techniques are fundamental to this high-performance propylene compound. Superior mechanical properties are highlighted that had never been achieved previously. Automotive applications are discussed where not only light-weighting has been achieved but successful cost reductions as well.

Surface Enhancements & Coatings Session

Paint, Color and Coatings for Autonomous Vehicles

Chris Seubert, Research Engineer, Ford

The push to develop autonomous vehicles and remote sensing systems, such as light detection and ranging (LIDAR), has created a need for colors and exterior parts to reflect IR radiation to ensure detection by the LIDAR sensors. These sensors have also generated a need for lens coatings that are highly transparent to the relevant radiation ranges, but also resist dirt, water, and other fouling during service. In this presentation we will identify how microstructural properties of paint systems affect the ability of LIDAR sensors to detect exterior parts and examine how hydrophobic coatings can be used to prevent fouling of polymeric and glass lenses that are used on LIDAR and camera sensors.

Coating Innovations on the Horizon

Karen Kukla, Key Account Manager – Automotive Interiors, AkzoNobel

This presentation will discuss the reduction of the carbon footprint by use of waterborne coatings and UV coatings. In addition, the importance of UV coatings to improve scratch and mar resistance, improve energy efficiencies and increase throughput will be discussed. Options for dual cure allowing for upgrade of conventional lines and coating formulations to meet customer needs will be covered.

In addition, the use of bright colors using Nano pigments and dyes, self-healing paint, easy to clean coatings for high gloss interiors, anti-glare coatings and UV reflective coatings to control interior temperature will be introduced.

Visual Assessment of Color - The Importance of Visual Color Harmony from Concept to Production

Perry Banta, *North American Regional Color Lead*, LyondellBasell

The automotive industry has been utilizing molded in color thermoplastic polyolefins (TPOs) for decades. In a data specific industry, the visual assessment of color in pre-colored materials remains critical for color approval.

Often color can be viewed as unacceptable while still being in tolerance numerically. At Lyondellbasell, the importance of color harmony between visual appearance and numerical evaluation is key. The critical nature of numerical and visual color harmony and how to successfully achieve and sustain both will be reviewed.

Understanding the Design Life of Materials. How is it Measured, Why you Should Care, and What is Possible

Chris White, Research Chemist, NIST

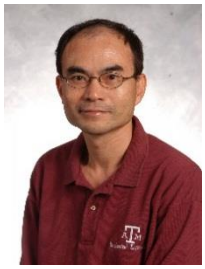
The NIST service life predictions, based on ASTM 1850, have included uncertainty calculations in polymer systems including poly(ethylene), poly(ester), poly(ethylene terephthalate), and epoxy. In each of these systems, a predictive model grounded in laboratory exposure data is validated with outdoor exposure data. Two complications in the widespread adoption of these methods is that requirement that the formulations are designed to degrade prematurely commercially viable systems to produce these predictions in a reasonable amount of time and the limited availability of the exposure equipment. Both considerations can be addressed with the development of commercially viable

exposure equipment. The efforts to incorporate this new equipment into the ASTM 1850 protocols will be detailed.

Adhesion Promotion Using Flame Plasma Surface Treatment - A Tutorial

Joseph DiGiacomo, Vice President, Flynn Burner Corporation

This paper describes the theory behind gas fired flame plasma surface treatment to promote adhesion of water based inks, coatings, adhesives, labels and other substrate laminates to polyolefin based substrates. Critical parameters in flame treatment are, flame chemistry, flame geometry, plasma output and distance of the burner to the part. The interrelationship between these variables, and how to control them for optimum surface treatment, will be discussed. The use of Schliren imaging technology, high speed photographs of the flame geometry, used to develop new burner designs, as well as advances in equipment technology will be presented.



Quantitative Determination of Adhesive Strength in Polymeric Laminates and Coatings

Dr. Sue, Professor, Texas A&M University

A testing methodology to evaluate the adhesive strength of epoxy coatings and multi-layered polymeric laminates was developed by implementing a linearly increasing normal load scratch test. Finite element methods (FEM) modeling was also carried out to quantitatively investigate the corresponding stress state that causes delamination to occur during scratching. By including the exact material constitutive behavior, surface characteristics, and geometry of each laminate layer in the numerical framework, the delamination strength of the laminates can be quantitatively determined using numerical modeling. The determination of the delamination strength between any layers is possible by normalizing geometric factors and material properties in the FEM model. This procedure can be employed to improve laminate performance through changes in formulation and processing conditions.

Over-molding Decoration (OMD)

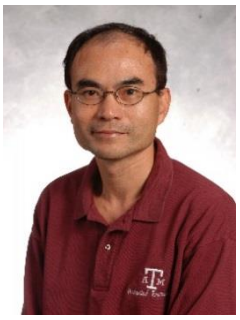
Tom Barr, Senior Vice President, Wavelock Advanced Technology Inc.

Decorating TPO can be a challenging and time-consuming process that typically requires multiple steps. New technology makes it possible to reduce the numbers of manufacturing steps, optimize efficiencies and expand your decorative options. The purpose of this presentation is provide an overview of the over-molding decoration process and show how it can produce unique finishes for both interior and exterior automotive TPO parts.

Characterization of Stress in Protective Automotive Coatings

Jennifer David, Senior Scientist, Momentive

Cracking and adhesion loss are two critical failure modes for coatings which protect exterior automotive plastics. Coating failure by cracking may occur when the instantaneous stress exceeds the stress threshold. Here, stress is determined in 5-10 µm protective coatings. A comparison is made of the relative importance of humidity and temperature to coating stress. The methods described are broadly applicable and enable characterization of the initial properties of a coating and their evolution in service.



Effect of Long-chain Branching on Scratch Behavior of Polypropylene

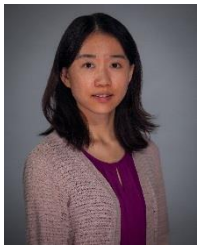
Dr. Sue, Professor, Texas A&M University

Incorporation of long-chain-branched (LCB) fractions is known to be effective in enhancing the melt strength of PP for demanding manufacturing processes, such as blow molding, thermal forming and foaming. In this study, the effect of LCB on the scratch behavior of a set of model PP systems has been investigated using the ASTM D7027/ISO 19252 standardized scratch test method, followed by quantitative microscopy analysis. Evaluations were based on the onset loads for scratch visibility, fish-scale formation and scratch depth measurements. It is found that LCB can improve the resistance against scratch-induced visibility by 40%, delay the onset of fish-scale formation by 35%, and lead to a much shallower scratch depth. Correlation between scratch behavior and the of LCB-PP material parameters has been established.

Experimental Observation and Numerical Modeling on Mar Behavior of Amorphous Polymers

Shuoran Du, Ph.D. Student, Texas A&M University

Mar is a type of subtle surface damage caused by a sliding object barely visible to human eyes. This minor damage phenomenon has rarely been systematically studied. In this presentation, mar behavior of a series of model amorphous polymers, i.e., PMMA, PC, and PS, were investigated based on a modified ASTM/ISO scratch testing methodology and a corresponding finite element methods (FEM) modeling. Furthermore, mar damage and material parameter relationship were established through a systematic FEM parametric study. Based on the above findings, a set of mar damage criteria are proposed. Strategies for improving mar damage resistance of polymers are introduced based on material constitutive behavior and surface property of the polymer.



Tuning the Haptic Profile of Soft-touch Waterborne Coatings with Organic Matting Agents and Feel Additives

Dr. Xiangyi Zhang, Senior Chemist, Edwin Nungesser, Research Scientist, Dow

Superior haptic and aesthetic properties are key attributes that automotive manufacturers rely upon to differentiate their brands. When properly formulated, matte soft-touch coatings can provide a significant aesthetic and haptic upgrade to surfaces. This work demonstrates the use of matting agents and feel additives to tune the haptic performance of waterborne coatings on flexible substrates. Using analytical tools, a sensory landscape is generated by measuring multiple surface characteristics such as friction, texture, and tack. This provides a knowledge base to build a correlative model between material properties and haptic performance.

Advances in Commercial Technology for Scratch & Mar Resistance in TPO Compounds

Mike McCormack, S&D Business Unit Manager, AESSE Sales & Distribution

Javachem®HG-600 is a specialty additive that imparts efficient scratch & mar resistance to the surface of automotive interior parts, including dashboards, door trim, center consoles, pillar trim and other PP and TPO auto-body parts. It contains a special functional group and imparts excellent and long-lasting scratch resistance without stickiness and yellowing after exposure to light at high temperature. It can also effectively avoid stress whitening problems that normally exists when scratch resistance agents are used.

This paper will discuss the structure and performance of silicone chemistry, the mechanisms of scratch & mar, how the anchoring effect of Javachem®HG-600 differentiates it from other technologies and allows excellent surface properties without additional exudation and stickiness. Supporting test data will be presented as well as commercial successes.

Bio Based & Recycled Materials

Effect of Water Absorption on Mechanical Properties of Recycled Thermoplastic Composite Materials

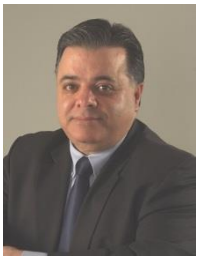
Dr. Sandeep Tamrakar, Research Associate, Ford

Recyclability of natural fiber and glass fiber reinforced polypropylene composites and glass fiber reinforced nylon composites have been studied through injection molding and mechanical grinding. Mechanical properties of virgin and recycled composites were assessed through flexural, tensile and impact tests. No significant degradation in mechanical properties of natural fiber composites was observed after several rounds of recycling. However, severe degradation in mechanical properties was observed for glass fiber composites. For instance, after five cycles of recycling, only 59% of flexural strength and 64% of flexural modulus was retained for glass fiber reinforced nylon composite, which is mainly due to attrition in the length of glass fibers after subsequent recycling. Water absorption tests conducted at room temperature showed no effect on any of the natural or glass fiber reinforced polypropylene composite. However, nylon composites absorbed about 8% water before reaching saturation point after 45 days of immersion.

Biocarbon- A Renewable and Lightweight Functional Filler for Polymer Composites

Ayse Ademagavun, Materials Technical Professional, Varroc Lighting System

Coffeee Chaff, miscanthus or switchgrass fibers are bio-sourced and renewable materials that can be used as fillers in various polymer matrices. Carbonization and oxidative acid treatments make these bio-material more compatible with polypropylene matrix with polypropylene matrix. These bio-carbons would replace talc to reduce the part weight by 8-20%, would reduce carbon footprint and improve sustainability of automotive industry. In this study, headlamp housings parts made with bio PP were compared and tested against talc PP performance.



Why a new generation of bio based olefinic materials are required for tomorrow's vehicle interior

Dr. Sassan Tarahomi, Chief Technology Officer, Alterra Holdings

Future vehicles require stronger, lighter and cost effective materials. Current bio based materials barely meet the existing material specifications or component performance requirement and cost more. Customer base is changing and they want bio based materials to be used in their vehicles. A dilemma for automotive OEMs and an opportunity for the bio based resin producers. Developing a new generation of stronger, cost effective bio based resins to meet the future vehicle performance will end this dilemma.

Improving the Properties and Durability of Recycled Automotive Plastics Bringing New Life by Restabilization

Nancy Cliff, Senior Scientist II, BASF

The goal of a circular economy, where plastics are recovered and recycled, is admirable, necessary, and challenging. There are many difficulties associated with the recycling of automotive TPO and TPE components, including the harvesting of the polymeric components, contamination of the material with both metals and paint, variations in polymer composition, and the presence of various fillers and pigments. Besides these challenges, it is virtually certain that the recycled polymer will have undergone both thermal and photo-oxidation chemistry, resulting in a polymer that has different - and usually inferior - properties than the virgin material. Even if only a portion of the new part is composed of partially degraded recycled material, the properties of the entire composition can be affected in terms of both initial and long-term (durability) performance. Contributing to this is the fact that any thermal and light stabilizers used in the original article will also be at least partially depleted.

In this paper we will demonstrate that by compensating for the depletion of the original stabilizers, it is possible to improve both the initial properties after processing, and long-term properties, such as thermal and photo stability, of the recycled material.

The Benefits of Micronized Rubber Powders for Thermoplastic Elastomer Compounding

Haikun Xu, Process Engineer, Entech Inc

In our previous study, micronized rubber powders (MRPs) have shown superior compatibility in thermoplastic polyolefins (TPOs) and excellent elastomeric properties while retaining the ease of processability and lowering costs of the compounds significantly. However, it requires efforts to explore the use of MRPs in useful products and a few challenges need to be addressed. In this study, MRP-filled TPEs were compounded at various loading ratios of MRPs and the effect of MRP sizes on the final compounds was investigated. The physical and mechanical properties were tested to study the overall performance of the compounds. The thermal properties of the compounds were characterized by TGA and DSC. In addition, the surface details of injection molded parts were studied with induction-heated molding technology to improve the surface finish for automotive applications. Finally, multiple conventional plastic processes were discussed and products made out of MRP-filled compounds were demonstrated to discover more potential applications.

Circular Economy new challenges and opportunities for the Plastic Industry: A Polyolefin producer approach

Daniel Bahls Pierera, Business Growth Manager, Borealis

Circular Economy is now on top of the agenda of many discussions, influencing political decisions, societal behaviour and consequently industrial strategy. As in other industries, the circular economy is also picking up speed in the automotive world. While there is some experience with using post-industrial recyclates already, there are several challenges related to a more extensive use of recycling material, especially from post-consumer sources. Borealis is eager to support the circular transition also in the automotive industry and aspires to offer a wider range of innovative recycling solutions, including recycled materials enhanced with fillers, and tailor-made post-consumer waste based compounds. In 2018, two of these solutions were used in several parts for a specially built Volvo XC60 T8 plug-in hybrid SUV at the Ocean Summit event in Gothenburg, Sweden. Borealis invites partners to a dialogue in order to accelerate the transition to a circular automotive industry.