



TRENDWATCH™

Materials for Advanced Mobility



WEBINAR
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Hello



**Brad
Trembath**



**Elizabeth
Rosson**



**Michelle
Maniscalco**

Brad Trembath

is responsible for new business growth and expanding customer specifications in emerging markets focused in the automotive power electronics, ADAS, and active/passive safety systems. He is also commercialization manager for new licensed technology that provides Electro Magnetic Interference (EMI) shielding using plastics. Prior to joining Avient in 2015, Brad worked for a Tier 1 automotive supplier and led a start-up within private equity focused on the utilization of natural gas as a transportation fuel.

Elizabeth Rosson

manages specification expansion and new business development in electric vehicles, battery advancement, and emerging technologies. With a passion for sustainability, she also serves as a mentor for starts-ups focusing on new material innovation. Prior to joining Avient in 2016, Elizabeth worked in commercial development at SABIC Innovative Plastics. She attended Virginia Tech and earned a degree in Materials Science & Engineering, minoring in Green Engineering.

Michelle Maniscalco

leads content marketing, PR, social media engagement, and web content optimization at Avient within the corporate marketing communications team. Prior to joining legacy company PolyOne in 2008, she engaged trade publication audiences with feature articles as a senior editor for various design and plastics titles at UBM Canon and Penton Media.



| MATERIALS FOR ADVANCED MOBILITY

Agenda

- ❖ About Avient
- ❖ Automotive Trends
- ❖ Interior
- ❖ ADAS
- ❖ Under the Hood
- ❖ Body & Interior Structure
- ❖ Exterior
- ❖ Alternative Power
- ❖ Aftermarket
- ❖ Solutions in Action

WELCOME TO AVIENT

A NEW KIND OF MATERIALS COMPANY



WELCOME TO AVIENT

A NEW KIND OF MATERIALS COMPANY

**Deep Customer Relationships
& Application Know-How**

We sell solutions not commodities.

16,000+
CUSTOMERS

**Superior Design Capabilities
& Advanced Analytics**

We iterate fast and often.

>75% of sales
**ARE CUSTOMIZED SOLUTIONS
TO UNIQUE SPECIFICATIONS**

**Global Footprint Strategically
Aligned to Serve Customers**

We produce locally, serve globally.



THE NEW AVIENT

ABOUT US



9,000
employees
worldwide



35,000+
formulations



~\$4 billion
in sales



\$1.6 million
donated
in 2019



105
facilities in
30+ countries

ENGINEERED POLYMERS AT AVIENT

Specialty Engineered Materials

High-performance polymer formulations to satisfy even the most demanding applications

GLS

Specialty TPEs that provide value for consumer, transportation, packaging and healthcare industries

NEU

High-quality medical polymers for short-term in-vivo applications for cardiovascular, intravenous, neurological and specialty segments

Advanced Composites

Innovative thermoplastic and thermoset composites for applications that require strength at a lower density

PlastiComp

Long fiber technology (LFT) composite formulations for metal replacement and light-weighting

Fiber-Line

Expertise in fiber processing, polymer formulation and coating technology to deliver specialty solutions

TRENDS IN AUTOMOTIVE

SHAPING INNOVATION & SOLUTIONS



Globalization of Low VOC/FOG/Odor Requirements



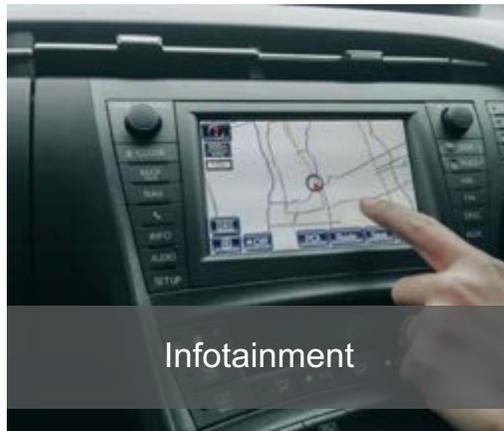
Luxury Feel & Functional Aesthetics



Lightweighting



Sustainability



Infotainment



Autonomous / ADAS & LiDAR



Electrification



TRENDS IN AUTOMOTIVE

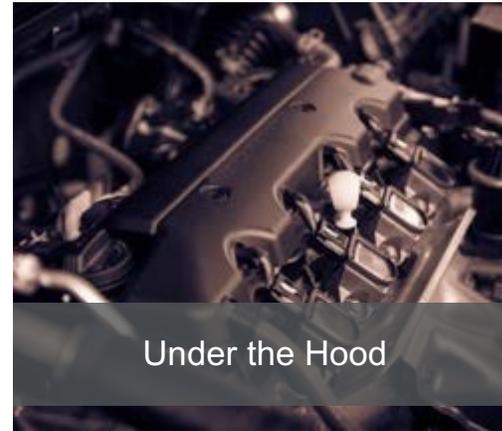
ALIGNED WITH SUB-MARKETS



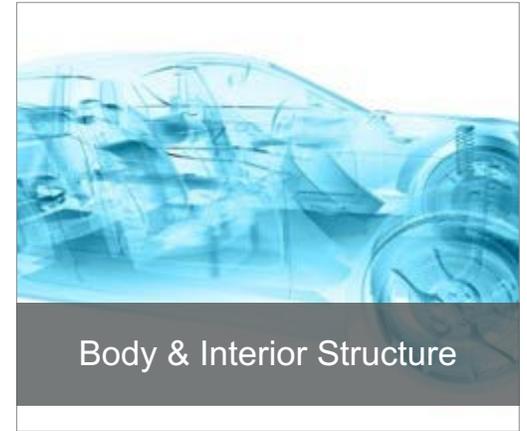
Interior



Autonomous & Advanced Driver-Assistance Systems (ADAS)



Under the Hood



Body & Interior Structure



Exterior



Alternative Power



Aftermarket





INTERIORS

INTERIORS



FOCUS APPLICATIONS & KEY CONSIDERATIONS



HVAC

- Industry standards for VIAQ
- Low odor
- Compression set at room temperature
- Ability to process in thin flow paths



TRAYS FASTENERS / CLIPS

- Long-term sealing performance, despite exposure to higher temperatures
- Vibration-related noise
- Industry standards for VIAQ
- Low odor
- Grippy feel, low gloss
- UV resistance
- Easy processing



TRIM / USER INTERFACES

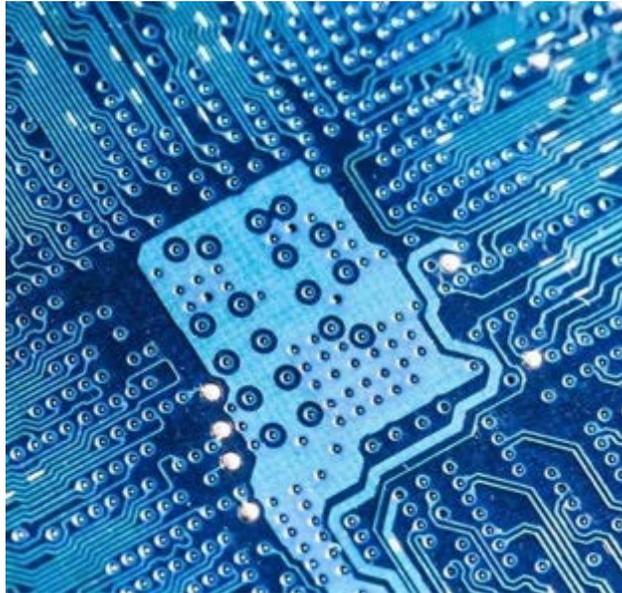
- Material heft
- Cool touch
- Soft touch



ADAS

ADAS

FOCUS APPLICATIONS & KEY CONSIDERATIONS



ENGINE COMPUTER HOUSING

- EMI shielding
- Prevent static dissipation
- High temperatures
- Impact resistance



CAMERA HOUSING

- EMI shielding
- Toughness and durability
- Splash chemical resistance
- Opaque, IR-transparent solutions



RADAR SENSOR MATERIALS

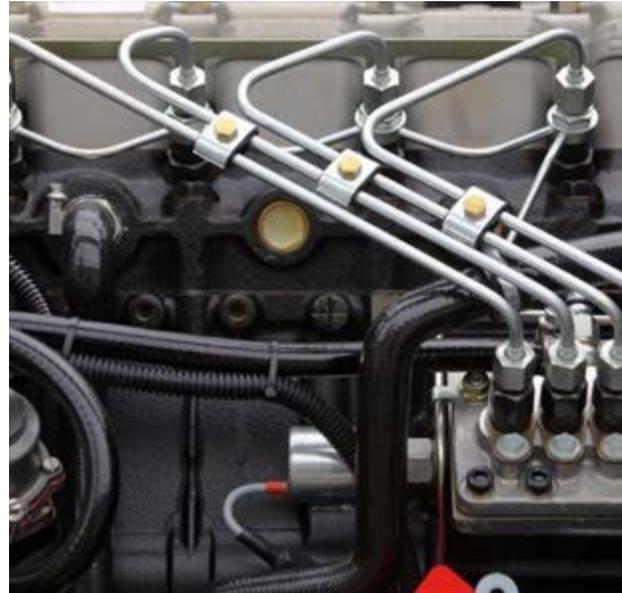
- Dielectric materials
- Low Dk / Df properties
- Radar-absorption products
- S-parameters



UNDER THE HOOD

UNDER THE HOOD

FOCUS APPLICATIONS & KEY CONSIDERATIONS



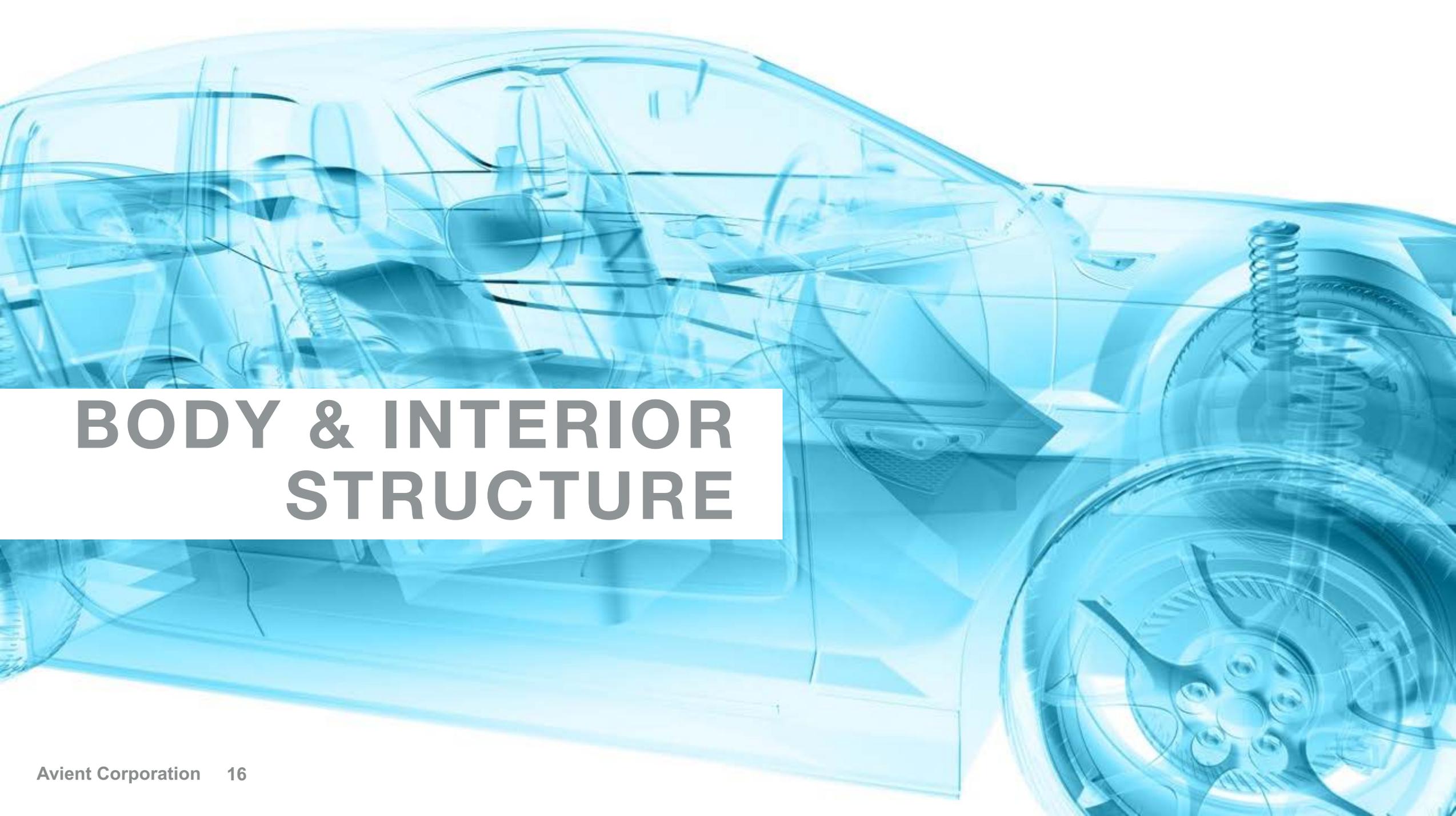
FUEL SYSTEMS

- Chemical resistance
- Dimensional stability
- Static dissipation



COOLING SYSTEMS

- Chemical resistance
- Dimensional stability
- Low creep
- Heat age resistance



BODY & INTERIOR STRUCTURE

BODY & INTERIOR STRUCTURE

FOCUS APPLICATIONS & KEY CONSIDERATIONS



DOOR CARRIER MODULES AND DASH CARRIER ASSEMBLIES

- Lightweighting
- Complex shapes with thin wall parts
- High flow



BRACKETS

- Part consolidation
- Lightweighting
- Eliminate secondary operations



SUNROOF TRACKS

- Low coefficient of friction (COF)
- Wear resistance

A close-up photograph of a car's exterior, showing the side mirror, door handle, and a highly reflective surface that mirrors the surrounding environment. A white rectangular box is overlaid on the center of the image, containing the word "EXTERIOR" in bold, grey, uppercase letters.

EXTERIOR

EXTERIOR

FOCUS APPLICATIONS & KEY CONSIDERATIONS



ROOF RACKS

- Aluminum replacement
- Impact resistance
- UV stability
- Finish options
- Post-consumer and post-industrial materials



MUD SPLASH GUARDS

- Low temperature performance
- Toughness and durability
- Splash chemical resistance
- Post-consumer and post-industrial materials



GASKETS

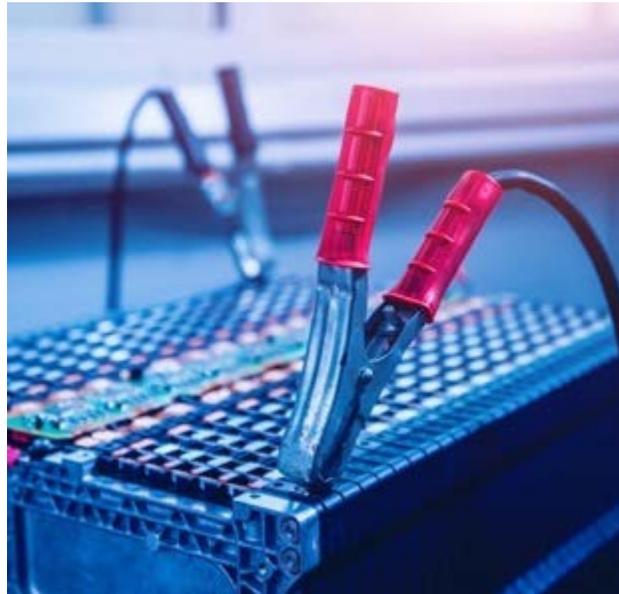
- UV resistance
- Compression set
- Long thin flow lines
- Splash chemical resistance

A photograph of a silver electric vehicle (EV) parked at a charging station. The car is in the foreground, slightly out of focus, with its front headlight and side mirror visible. A red charging cable is plugged into the charging port on the side of the car. The background shows a building with large windows, suggesting an urban or commercial setting. The overall scene is brightly lit, likely during the day.

ALTERNATIVE POWER / EVs

ALTERNATIVE POWER

FOCUS APPLICATIONS & KEY CONSIDERATIONS



BATTERY SYSTEMS

- Thermal management
- Impact resistance
- UL94 V-0
- Lightweighting
- Chemical (Ethylene glycol) resistance



T3 / CHARGING CABLE JACKETING

- Electrical performance
- Water resistance
- Crush resistance



AFTERMARKET

AFTERMARKET

FOCUS APPLICATIONS & KEY CONSIDERATIONS



ROOFTOP CARRIERS

- Impact resistance
- UV resistance
- Pad vibration management



BIKE RACKS

- Aluminum replacement
- Impact resistance
- UV resistance
- Load-bearing capacity



FLOOR MATS

- Low odor
- Grippy
- Scratch & mar resistance

**SOLUTIONS IN
ACTION**



MEETS VIAQ STANDARDS

TIER 2 SUPPLIER

H V A C F L A P

SOLUTION

Low VOC/FOG TPE material

BENEFITS

- Reduced processing steps and lowered energy costs for the molder
- Achieved targeted odor levels and met VOC / FOG performance and compression set standards

KEY REQUIREMENTS

- Eliminate post treatment heating of parts to achieve required odor level (≤ 3.0 VDA 270)
- Lowest VOC / FOG performance (VDA 278) at the same compression set as previous material

LOW VOC/FOG + SURFACE FINISH

GLOBAL OEM + TIER 1 MOLDER

CUP HOLDER MAT

SOLUTION

Avient OnFlex TPE Portfolio

BENEFITS

- Provided excellent low VOC/FOG properties and lower density than previous solution with a specialty TPE grade
- Delivered high-quality aesthetics, including soft touch and low gloss finish
- Offered global support and production capabilities to allow molder to source the grade globally

KEY REQUIREMENTS

- Low odor material
- Excellent surface finish

ELECTRONIC CONTROL UNITS HOUSING

REPLACE

Aluminum housing

SOLUTION

Electrically conductive, long fiber thermoplastic

BENEFITS

- Improved protection of ECUs and nearby components with EMI / RFI shielding
- Prevented damage to data storage
- Provided high modulus, temperature resistance and strength

KEY APPLICATION NEEDS

- Achieve equivalent EMI shielding to aluminum housing
- Prevent static dissipation
- Maintain structure and properties when exposed to high temperatures and possible impact

CAMERA HOUSING

REAR-VIEW CAMERA

REPLACE

Vacuum metallized, non-conductive plastic

SOLUTION

Electrically conductive, long fiber thermoplastic

BENEFITS

- Provided required EMI/RFI shielding
- Eliminated the vacuum metallization step

KEY APPLICATION NEEDS

- Achieve required EMI/RFI shielding at the component (55 dB)
 - Target: material shielding effectiveness > 95 dB
 - Gap: Alternative conductive polymer materials (80-85 dB SE) failed to meet the shielding requirements at the component level
- Reduce overall system cost

IMPACT + UV STABILITY

MAJOR AUTOMOTIVE OEM ROOF RACK

SOLUTION

ReSound™ PIR Post-Industrial Recycled
Nylon Formulation

BENEFITS

- Developed a supply chain agreement to ensure reliable supply and mitigate risk
- Provided just-in-time delivery to help the customer keep working capital low and maximize warehouse space
- Provided a product that supports sustainability to potentially enhance the marketplace appeal of the customer's end product

KEY REQUIREMENTS

- Impact resistance
- UV stability over time
- Color match to specific black color

AUTOMOTIVE OEM

MUD SPLASH GUARDS

REPLACE

Thermoplastic Vulcanizate (TPV)

SOLUTION

PIR-Content TPE

BENEFITS

- Offered a 29% post-industrial recycled (PIR) solution that met automotive specification properties
- Leveraged understanding of the material approval process and existing relationships with molders to facilitate the program with OEM-preferred tiers
- Engaged application development and technical service teams for material selection and processing support
- Eliminated drying step in processing versus incumbent TPV material

KEY APPLICATION NEEDS

- Minimum 25% recycle content
- Meet property requirements of automotive specification specific to exterior applications, including:
 - Toughness and durability
 - Splash chemical resistance
 - Low temperature performance

THERMALLY CONDUCTIVE FORMULATIONS

POSSIBILITIES

Applications that require heat management:

Transportation: automotive under-hood components and aerospace flight deck electronics

Appliance: ice makers and refrigerators

E&E: LED lighting heat sinks and semiconductors

Healthcare: medical radiation shields

Consumer

SUSTAINABILITY

Facilitates lightweighting and increases electrification, leading to lower fuel consumption and CO₂ emissions

Extends product life via effective thermal management

Lowers cost versus cast or machined components

Reduces assembly costs due to part consolidation

THERMALLY CONDUCTIVE FORMULATIONS

Filled polymer that uniformly dissipates heat (not insulative)

WHAT IT DOES

Combines similar thermal conductivity and cooling capabilities of metals such as aluminum and steel with the design freedom, weight reduction and cost advantages of thermoplastics

Provides increased design freedom versus metal components

Matches convection rate and thermal conductivity rate for greater efficiency

Does not corrode or oxidize

Finished parts are durable and lightweight

PROCESSES

Extrusion, injection molding



Lightweighting



LONG FIBER COMPOSITE TECHNOLOGIES

LONG FIBER REINFORCED THERMOPLASTICS

Thermoplastics reinforced with long carbon, glass or specialty fibers

WHAT IT DOES

Provides extremely high stiffness, strength and toughness, and improves creep and fatigue performance

Parts maintain dimensions after molding

Provides exceptional surface finish versus traditional short-fiber materials

Available in custom colors

Warmer to the touch than metal components

Offers corrosion and chemical resistance

PROCESSES

Injection molding



Lightweighting



POSSIBILITIES

Applications in which high strength and light weight are desirable:

Automotive underhood and body parts

Automotive ADAS housings and brackets

ATVs and sporting equipment

Industrial

Aerospace

SUSTAINABILITY

Provides lighter weight alternatives to steel (~80% lighter) and aluminum (~50% lighter)

Uses less energy for transport (due to weight reduction)

Consolidates parts to simplify manufacturing

FLAME RETARDANT POLYOLEFIN FORMULATIONS

POSSIBILITIES

Applications that would benefit from flame retardant polypropylene including:

Jacketing and cross-web for wire & cable installed in enterprise (residential or commercial) and industrial (factory) settings

Other consumer, industrial, appliance and transportation applications

SUSTAINABILITY

Can be formulated with recycled PP, PE

Replaces costly FEP in 2/4 to 4/4 pairs, maintaining plenum flame performance while reducing overall cost

Halogen-free, flame retardant grades meet UL Yellow Card Rating

FLAME RETARDANT POLYOLEFIN FORMULATIONS

Formulated for category cable insulation and cross-webs subject to demanding flame performance

WHAT IT DOES

Provides either halogenated and non-halogenated material to partially replace costly FEP

Meets stringent flammability performance requirements defined by Underwriters Laboratories (UL) including UL 94 V-2, V-0 and 5VA

Offers low dielectric constant (< 3)

Balances tensile and elongation properties

PROCESSES

Extrusion, injection molding



Recycling

LOW SMOKE AND FUME, NON-HALOGEN FORMULATIONS

POSSIBILITIES

B&C: residential & commercial buildings / industrial plants / rigid building sheet

Transportation: trains / subway or ships

Telecommunications

Flexible conduit

Pipe & injection molded pipe accessories

Plugs & connectors

IMPACT

Maintains flame retardance without the use of halogens

Reduces customer risk

Lower smoke and toxicity

Resistance to environmental stress cracking

Reduced buildup of smoke and fumes affords more time for escape, and safer entry for emergency personnel

LOW SMOKE AND FUME NON-HALOGEN FORMULATIONS

Non-halogenated, flame retardant system, that, when burning, helps to limit the generation of smoke and toxic fumes

WHAT IT DOES

Provides a flame retardant system with very low toxicity and smoke density

Maintains low emission of corrosive gases when burning, resulting in less damage to equipment, and enhances human safety

Helps customers to meet international building and construction standards

PROCESSES

Extrusion



Eco-conscious



Q&A



Thank You!

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