A fully integrated and independent Supply Chain – for the Automotive Industry

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<th>GROUP COMPANY OF MITSUBISHI CHEMICAL</th>
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<td>PET Films</td>
<td>Mitsubishi Polyester Film GmbH</td>
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<td>Bio Polymers, TPEs, PVC Compounds, Adhesives, 3DP Filaments</td>
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<td>Engineering and Simulation of CF/SGF reinforced Parts</td>
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<td>Carbon Fiber Forged Molding Compounds (PCMC) – Prepreg (PCM)</td>
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<td>MMA for PMMA Resins, Coatings, Lubricants, Adhesives</td>
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<td>Formulated Electrolytes for Li-Ion Batteries</td>
<td>MC Ionic Solutions UK Ltd.</td>
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<td>Production of Carbon Fiber reinforced applications</td>
<td>Wethe Carbon Composites GmbH</td>
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<td>Polypropylene (PP) Compounds, Long Glass Fiber Polymers (LGF-PP)</td>
<td>MCPP Germany (Japan Polypropylene Corporation)</td>
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Mitsubishi Chemical Corporation

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– To the Automotive Industry.

Mitsubishi Chemical and its group companies are dedicated to the automotive industry with R&D aimed at interior, exterior and functional applications, as well as solutions for autonomous and electrified vehicles.

Our focus is on developing and bringing to market lightweight, sustainable materials for today’s and future automotive industry needs.

*Mitsubishi Engineering-Plastics is a joint venture between Mitsubishi Gas Chemical (50%) and Mitsubishi Chemical (50%)*
Automotive has been an integral industry for Mitsubishi Chemical, with a long history of partnership and development with the top OEMs. R&D and growth in high performance materials aimed at interior, exterior and functional applications is at the core of our corporate strategy. Our focus is on developing and bringing to market lightweight, sustainable, high value and premium aesthetic solutions.

Mitsubishi Chemical and its group companies offer an impressive portfolio ideal for automotive lightweighting such as carbon fiber, composites, high performance TPOs and LGF-PPs, TPEs and TPVs, engineering plastics, films and other materials. As a solution-driven partner, Mitsubishi Chemical is bringing together high performance MATERIALS, engineering PROCESSES and innovative DESIGN expertise to allow automotive interior to achieve bold, distinctive styling and new levels of functional integration.
Marvyflo™ PVC – Slush decorative skin
High flow PVC powders designed for the production of instrument panels, door panels, glove boxes and other automotive interior surfaces.

- Supreme design freedom
- A stress-free configuration
- Best cost-performance ratio
- Soft “leather-like” touch

New development TS grades:
- Visual aspect: no airbag show-through and dimensional stability
- Weight reduction: -15%, 0.3kg/car vs. with conventional PVC Slush grades
- Improved deployment performance
FUNCSTER™ LGF-PP

Pultruded, long glass reinforced injection molded grade PP has long been known for structural applications. Recently, FUNCSTER™ has also become the trusted appearance-grade LGF-PP material in the automotive market due to the unmatched glass dispersion.

FUNCSTER™ has been instrumental in the technological advancements and development of inner liners for composite tailgates in the automotive industry, where the material is colored and visible. Because of the advancements in the technology, manufacturers can now achieve better cost structures with weight reductions, part number reductions, and cycle time reduction for key functional and structural parts.

Two years of development in optimizing dispersion has resulted in excellent dispersion to allow molded-in color while maintaining LGF-PP properties in the interior first surface. FUNCSTER LGF-PP used for the inner and structure of liftgates brings the strength of a steel replacement with no visible bundles of glass. In addition to the injection molding styling flexibility.

- Manufactured by Original Melt Pultrusion Process
- High Rigidity and High Impact Resistance
- FUNCSTER™ has excellent GF dispersion (almost no GF Bundle) in molded articles
- Domestic Material production or NA: Covington, GA
- High Rigidity, High Impact Resistance, High Strength, High Flowability
- Low Specific Gravity
- FUNCSTER™ LGF-PP replaces Steel and Glass Filled Thermoplastics (i.e. PA6/66)
- Weight Reduction, Part Integration

<table>
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<tr>
<th>Interior Instrument Panel</th>
<th>Structural Carrier Tailgate</th>
<th>Visible Interior Tailgate Structure</th>
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<tr>
<td>FUNCSTER™ LGF-PP</td>
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</tbody>
</table>
THERMORUN™ – Designed to protect.

Chosen for performance and characteristics, easy processing, global availability and the global technical support team, THERMORUN™ is the leading global material for safety critical applications. THERMORUN™ is a high performance thermoplastic elastomer (TPE) with unique key factors designed for the manufacturing of chute channels:

• Suitable for soft and hard Instrument Panels
• Lightweight (low density)
• Very good cold deployment behavior
• Elevated high temperature strength
• Cost efficient (no fabric required)
• Easy processing (no inserts, high MFR)
• High welding strength to PP (compatibility to PP)
• Complying with automotive standards for Emission and VOC
• Wide range of THERMORUN™ grades with tailored mechanical properties
• Fulfilling all specifications and safety requirements for airbag systems

Leading the way in automotive safety applications, THERMORUN™ solutions have been developed to comply with the highest OEMs and Tier 1 safety specifications.

With more than 30 years of experience with TPE airbag materials, we can offer our customers comprehensive support for all aspects of numerical part design for our THERMORUN™ grades.

Process Simulation
• Material cards for THERMORUN™ grades for process simulation
• MoldFlow analysis for customer parts
• Recommendation for tool design

Deployment Simulation
• Material cards for THERMORUN™ grades for crash simulation
• Strain rate dependent failure model
• Stress state dependent failure model
MOSMITE™ – Moth-eyes type antireflection film
Mitsubishi Chemical has launched a new seamless roll-to-roll mass production manufacturing process for our proprietary moth-eye antireflective films MOSMITE™. The MOSMITE™ surface is an array of hundred-nanometer scale graded refractive index microstructures. The film reflectance is very low on the wavelength of visible light from 380 to 780 nm, resulting in superior antireflective properties. Moreover, the color tone of remaining trace reflections is natural.

Diakon™ high gloss PMMA
- High Gloss
- Available in Clear and Colours
- Suitable for 1K and 2K moulding types
- Excellent Weatherability

lupilon™ K Series – Transparent and High-Surface-Hardness
- Special type of polycarbonate
- Same level of transparency with general PC
- Pencil hardness without coating: 2H
- Low-birefringence Effect
- Flame Retardant Grade (UL 94 V-0)
- Good amine resistance
- Pencil hardness without coating: 2H

Light Diffusion, Edge Lighting, Light Guides

Acrypet™ PDA Series - PMMA
Utilising unique edge lit technology to create bespoke light diffusion design effects for automotive applications.
- Diffuses light when the LED is turned on
- Appears clear when light is off
- Suitable for injection molding
- Ease of processing
- Functional Colour PMMA: Optical Diffusion

lupilon™ - Xantar™ - PC for light guides and ambient lighting
- Very high flow
- Thermal-mechanical stability
- Low yellow index
- Diffusive grades in various color

Selective Light Transmittance

DURABIO™ Piano Black – Colored Illumination
DURABIO™ offers deep piano black appearance when the backlight is turned off. When illuminated, the panel transmits a selective color, providing a unique aesthetic appearance.
- Only transmits light of selected wavelength
- Looks deep piano black when not illuminated from the backside
- Brings good scratch resistance as well as chemical resistance
- Eliminates painting process, offering total cost reduction
- Further cost reduction by part consolidation
- Design Freedom
- MCC can control the wavelength to pass through Durabio
- BIO based polymer (>50%)
**Acrypet™, Diakon™**
Acrylic polymer technology from Lucite International designed specifically for injection moulded automotive interiors. Be it high gloss, impact requirement, enhanced flow around instrument clusters, in clear or color for control buttons, Lucite International demonstrates our continued willingness and technical ability to provide bespoke acrylic polymer grades to meet the requirements of our customers.

To answer the need of the automotive market for back-lighting of chromed parts, MEP developed a new chrome plate-able and light translucent grade:

**XANTAR™ CP 200 LT – Light Transmission:**
- Conserve the good flow
- Very stable and white color - Perfect for back-lighting
- Excellent light transmission
- UV resistance
- Low yellow shift for transmitted color
- Very good chrome adhesion

**DURABIO™ – High Gloss Surface, In-Mold Structural Design**
- Highly transparent
- Brilliant optical properties
- Excellent high gloss surfaces
- Better scratch resistance vs. other polymers
- High chemical resistance (e.g. sunscreens)
- Great UV resistance
- Impact resistance
- No hardcoat necessary
- Mold in color - cost reduction
- Easy to process - high flow
- Excellent transcription of the pattern from the tool
- Lasermarking / Laserstructuring possible
- BIO based polymer (>50%)

**DURABIO™ – Comparison vs. PMMA and PC**
These Low Weight Reinforced Thermoplastics (LWRT) make up a product group of special lightweight plastic composites with low thermal expansion and excellent mechanical and physical properties. The mixed glass and polymer fiber fleeces produced in special textile processes are supplied as rolls and boards and can be cost-efficient further-converted into three-dimensional components by low-pressure moulding. The ultra-light, freely shapeable SymaLITE™ thermoplastic is noise-absorbent and can be faced directly with functional and decorative cover layers without adhesives having to be used. This eliminates an entire production step. Mitsubishi Chemical Advanced Materials Composites supplies SymaLITE™ as pre-consolidated boards.

- Sound absorbing
- Chemically resistant: Oleo-/ Hydrophobic
- Flameretardant
- Impact resistant
- Mixed PP+GF Fibers fleece - prelaminated panels
- Mechanical / acoustical properties adjustable: AW 700 to 2200 g/m²
- Light weight glass- and Polypropylene (PP) fiber reinforced material
- Area weights between 700 to 2200 g/m²
- Glass fiber content: 40 % / 50 %
- Functional layers applied inline

SymaLITE™ provides a considerable weight saving potential compared to conventional solutions as well as good acoustic performance. Applications including decor are molded by one press-stroke.

GMT / GMTex™ / QTex – Composite Sheets are composite materials for structural applications with very high mechanical requirements. Typical applications include metal replacement and crash relevant parts. Glass-mat or glass-weave reinforced materials with a thermoplastic matrix. Processed by Pressforming – also in combination with other processes (IM, D-LFT). Hybrid combinations are also possible (GMT + GMTex™ + QTex + SymaLITE™). Typical achievable weight savings ~50 % vs. steel / ~30 % vs. aluminum.

Application Example: High performance GMT/GMTex™ seat part
- Improved safety due to excellent material crash behavior
- The safety belt guides and the fixation for textile and/or leather liners are integrated in the part
- Achieved weight reduction of 6.4 kg per part compared to the steel solution
Hostaphan™ PET Film – Seats-Airbag Detector Systems

- Transparent, high temperature resistant substrate (PET film) for driver detection and car seat heating
- The PET film’s thermal behavior (shrinkage) and surface properties (resin) requirements are higher than the standard to ensure reliable electric circuitry in final product
- The PET film is heat stabilized and coated by a 3rd party converter before used in the seat system

BENEBIOL™ PCD – Vegan Leather Seats

BENEBIOL™ is used as a raw material of highly durable polyurethane resin for synthetic/artificial leather. It easily reacts with isocyanate compounds (e.g. MDI, TDI, IPDI, H12MDI) and generates polymers with superior characteristics. Proprietary manufacturing technology enables production of unique composition and higher molecular weight PCDs with stable product qualities.

- Chemical resistance
- Hydrolysis resistance
- Abrasion resistance
- Weather resistance
- Flexibility at low temperature
- High mechanical properties
- High hardness
- BioMass based
THERMORUN™ – airbag covers for all airbag types
The products portfolio includes a complete range of solutions dedicated to the manufacturing of airbag covers and housings: Mold-In-Color (MIC) and paintable grades are available from 250 to 500 MPa. MCPP is a world leader in airbag solutions with over 30 years of experience.

- Outstanding cold and hot deployment behavior (-40°C to +85°C in chamber)
- Cost efficient painted and MIC solutions
- Easy processing (reduced split line visibility)
- Improved split line opening
- Fulfilling all specifications, safety and emissions requirements
- High quality appearance
- Meeting customer expectations regarding haptic and surface

A wide range of THERMORUN™ grades for all types of airbag cover applications is available:

<table>
<thead>
<tr>
<th>Driver</th>
<th>Knee</th>
<th>Curtain</th>
<th>Active Glove Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Side</td>
<td>Rear Side and Knee</td>
<td>Pedestrian</td>
<td></td>
</tr>
</tbody>
</table>

Airbag cladding - Pillar Trim
Xantar™ C MC series – PC/ABS for ductility at low temperature
MEP developed Xantar™ C MC series for the three typical interior automotive heat levels:

- Xantar™ C MC 3650 (Vicat 111°C - 50°C/50n)
- Xantar™ C MC 3652 (Vicat 123°C - 50°C/50n)
- Xantar™ C MC 3654 (Vicat 132°C - 50°C/50n)

- Excellent low temperature impact ductility
- Outstanding melt flow index
- High flow and high impact
- Low styrene emission level
- Stable impact performance at a broad temperature range
- Stable deployment for airbag application

Thermoplastic Polyolefins and Polypropylene Compounds
From development and testing to manufacturing high performance polymer solutions, Mitsubishi Chemical sets the standard for consistency, quality and innovation. Within the automotive industry, we have a strong history of proven performance compounding high performance engineered polyolefin. Interior applications include trim panels, interior cladding, tailgate covers, air vent grilles and more. Available for painted and mold in color applications.
Nichigo G-Tape™ is a hand-tearable, residue-free and highly weather resistant tape. These features offer many solutions to automotive industry and after markets.

- Innovative pressure-sensitive tape
- Hand-tearable, requiring no knives
- Leaves no residue on most surfaces
- Can easily be removed from itself and reused, unlike standard duct tapes
- Higher tensile strength and dimensional stability than conventional gaffer tapes or duct tapes

Benefits and Advantages:
- Easy to tear, no tools needed
- Clean removable, no residue on most surfaces
- UV and water resistant
- Different colors
- Different adhesion strengths

Technical Data:

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Masking and Protection</th>
<th>Waterproof and Airtight</th>
<th>Double Sided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>mm</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Adhesion Strength</td>
<td>N/15 mm</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Holding Power*</td>
<td>mm</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
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<tr>
<td>Tensile Strength</td>
<td>N/50 mm</td>
<td>0.2</td>
<td>1.0</td>
<td>10</td>
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<tr>
<td>Elongation</td>
<td>%</td>
<td>15</td>
<td>17</td>
<td>16</td>
</tr>
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</table>

Note: Above figures are measured values based on test method of JIS Z-0237. The technical information and data are typical values for reference, not specifications. *The measure of slippage in one hour while holding a metal plate.