Lightweight structures with new car technologies

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LANXESS – A premium supplier of high-tech plastics for demanding technical applications

- Main industries of LANXESS’ high-tech plastics are automotive (>50%) and electro / electronics (>20%)
- LANXESS’ leading high-tech plastic brands: Durethan®, Pocan®
  - Recognized as intelligent system solutions
  - Combining mechanical strength with resistance to heat, oils and abrasion
- New service brand HiAnt®
  - Tailored international customer service and in-depth know-how in product, application, process and technology development
- Main Business Unit: Semi-Crystalline-Products (SCP) belonging to Performance Polymers Segment

LANXESS provides premium high-tech plastics

Sources: JD Powers 08/2010; LANXESS own estimates
LANXESS – A leading development partner for the automotive industry

- More than 20 years of experience in compound technology
- Inventor of the hybrid technology
- Innovative materials and concepts for new application fields in automotive and motorcycle manufacturing
- Well acquainted with various demands by the automotive industry
- Valuable expertise from other industries (e.g. electro)
- Important contribution to future E-mobility, alternative fuels and flame protection

Valuable experience and focus on innovation for the future of mobility
Growing car production and trend of weight reduction drive demand for high-tech plastics

- Global car production with annual growth of ~3.3%
- Increased usage of high-tech plastics per car drives growth of 7% p.a.
- Global production of light vehicles will increase by 30% within 5 years
- Current high-tech plastic share in Western cars 15-17%
- Chinese vehicles only consist of about 7% plastic components → Growth potential
- E-mobility further pushes high-tech plastics → Total share of plastic expected to exceed 25%

Innovations in high-tech plastics enable future mobility

Sources: JD Powers 08/2010; Polymotive; Plastics Europe 2010; LANXESS own estimates; Handelsblatt.com (Oct. 21, 2010), 4
Comparison of different fuel economy standards worldwide

Comparison of actual and projected fuel economy for new passenger vehicles

Increased use of high-tech plastics as basis for automotive innovation

Thermoplastic in automobiles

Thermoplastic in trucks

Innovative materials lead to weight and cost reduction, greater safety and comfort
What is “Plastic/Metal Hybrid” (PMH)?

Metal sheet

Polyamid 6 GR
Production process (1/3) – Deep-drawn metal sheet
Production process (3/3) – Finished product
Deformation under bending load

<table>
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<th>Force F [kN]</th>
<th>Deformation f [mm]</th>
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- **Plastic/metal composite profile**
- **Closed sheet steel profile**
- **Open sheet steel profile**

- 50
- 340
- 340
Cross-section of a plastic/metal hybrid structure
Typical application of Plastic/Metal Hybrid: front ends
Examples of Plastic/Metal Hybrid front ends out of Durethan®

|----------------|----------------|-------------------|-------------------|-----------------------|-------------------|---------------------|---------------------|

More than 70 models in mass-production
Far more than 50 mn parts on the road
Plastic/Metal Hybrid – Part of the body structure
Plastic/Metal Hybrid – Pedal box

- Worldwide first pedal box with PMH
- Material Durethan BKV 30 H2.0
- 10% cost and weight advantages compared to conventional design
- Integration of numerous functions
- Ductile crash behavior

Shift gear

Automatic gear
Continuous fiber reinforced thermoplastic composites (CFT) – Overview

- State-of-the-art technology for aircrafts
- Challenge: cost optimized and ready for mass production alternatives for the automotive industry
- High-tech plastics with glass, carbon, aramid or mixture
- 2D semi-finished product (panel) based on a thermoplastic matrix
- Easy alteration to 3D shape
- Fabrics or uni-directional fabric made of continuous filaments
- Complete impregnation

CFT for demanding mobility solutions
Continuous fiber reinforced thermoplastic composites (CFT) – Advantages and challenges

**Advantages**
- Low weight – high strength
- Excellent crash performance
- No corrosion and easier recycling
- Integration of functions
- Possibility of complex designs
- Low investment

**Challenges**
- Influence of temperature and water absorption

High performance systems for greater safety, efficiency and sustainability
Continuous fiber reinforced thermoplastic composites (CFT) – Examples

Door impact beam

Steering column

One shot molding process
Innovative high-tech plastics for the future of mobility

LANXESS Semi-Crystalline Products – High-tech plastics key for future sustainable mobility

Expertise in customer-oriented R&D and cutting edge product properties

Cost and performance optimized solutions ready for mass production

High-tech plastics material leadership and engineering know-how
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