



THE FUTURE OF AUTOMOTIVE DESIGN WITH COVESTRO

WHEN LIGHTWEIGHT & AESTHETICS MEET MATERIAL

Terence Yau, Vice President of Polycarbonates China
13-9-2018



Covestro – leading in the world of plastics



- €14 bn in sales
- 16,200 employees¹
- Listed on the DAX stock exchange



- Large portfolio
- Products and solutions for many industries



- Global player
- 30 sites worldwide
 - Close to markets, customers and suppliers



- Highly innovative
- 1,000 employees in R&D
 - 80 years of ideas and inventions



Polyurethanes (PUR)



Key markets:
automotive, construction,
domestic appliances,
furniture and mattresses

The material can be rigid,
soft, elastic or thermo-
formable (thermoplastics).

Covestro develops and
manufactures the key
polyurethane components:
polyols and isocyanates
such as MDI and TDI.



Polycarbonates (PCS)



Key markets:
automotive,
electrics/electronics,
construction, medical

Polycarbonates are
transparent, break-
resistant and readily
formable high-tech
plastics.

Polycarbonates are
marketed as granules,
sheets and films.



Coatings, Adhesives, Specialties (CAS)

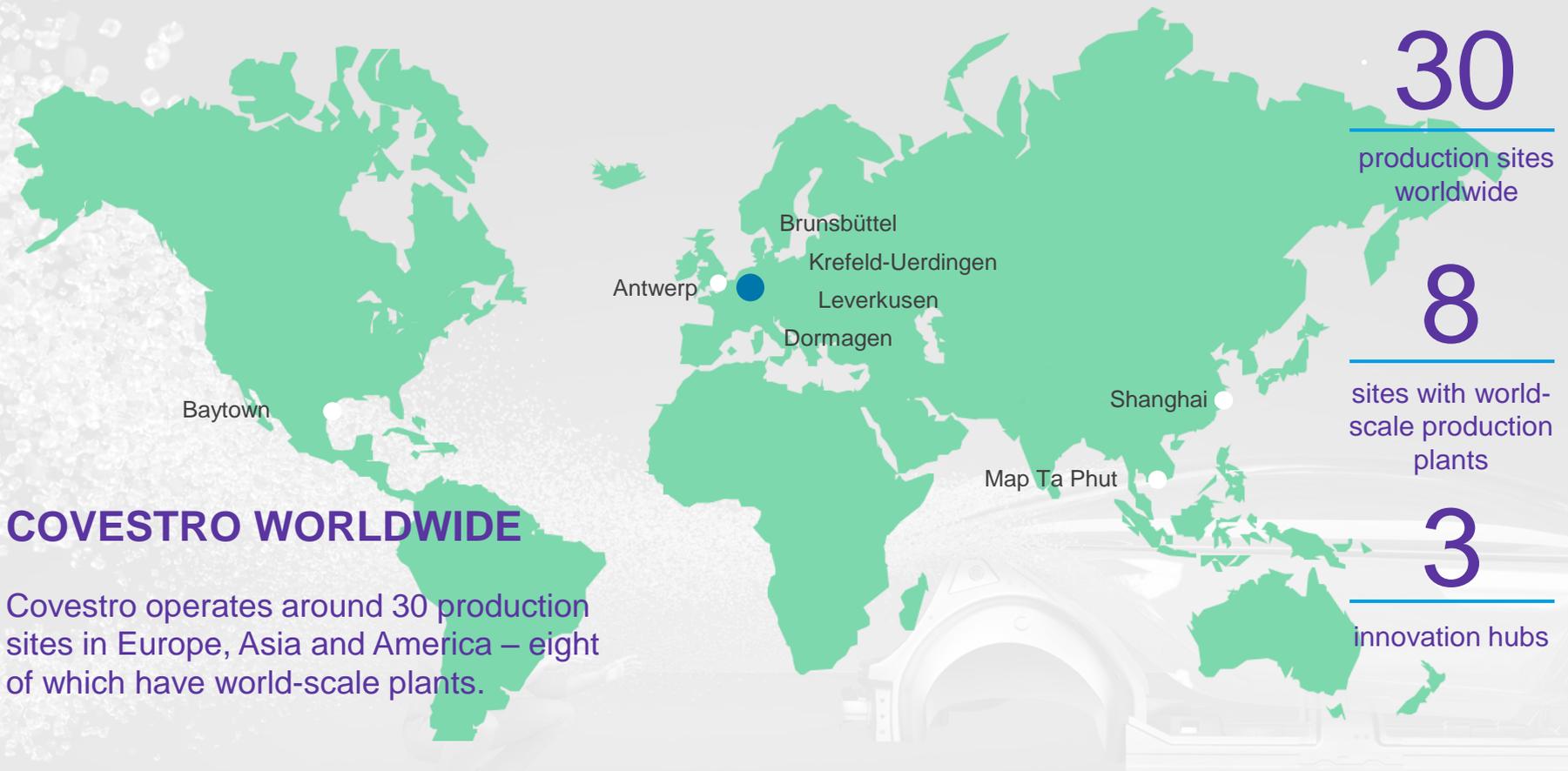


Key markets:
automotive and
transportation, corrosion
protection and
construction,
electrics/electronics,
wood and furniture,
cosmetics, medical,
sports and leisure

Covestro provides raw
materials for surface
coatings, adhesives and
sealants as well as
specialties.



Our presence in the globe



COVESTRO WORLDWIDE

Covestro operates around 30 production sites in Europe, Asia and America – eight of which have world-scale plants.

Our holistic approach for sustainability

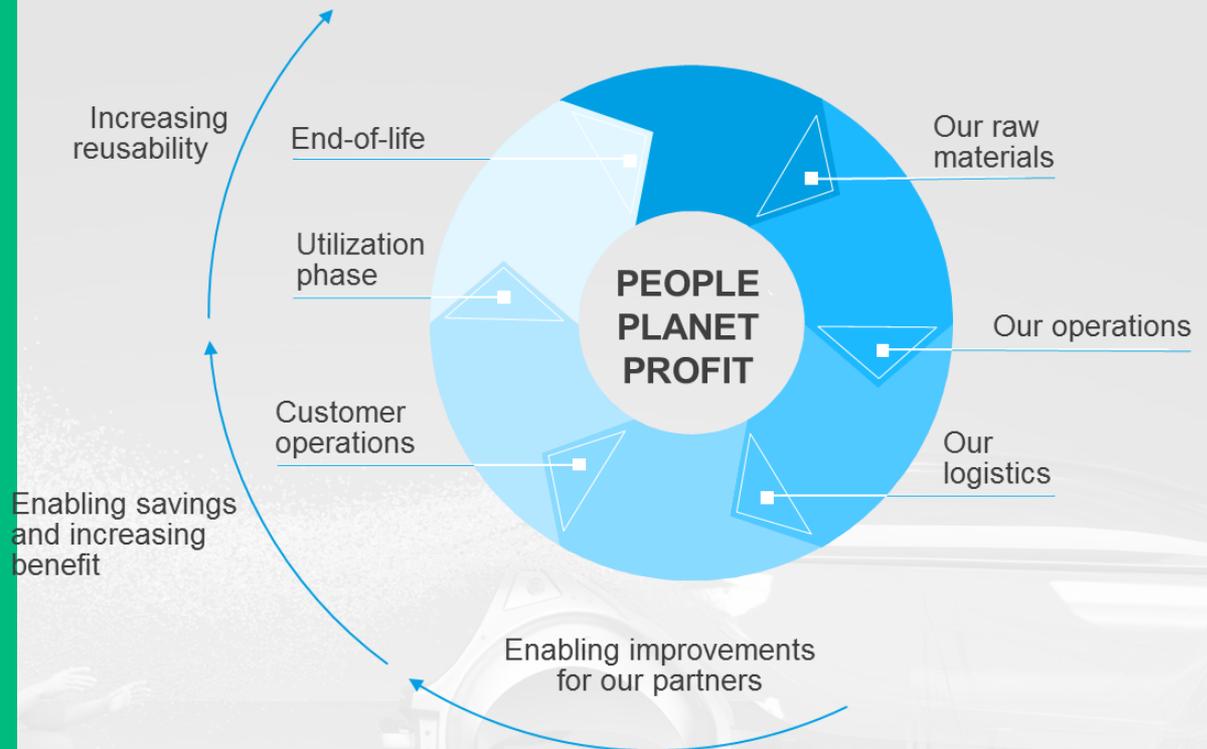


Focusing on the whole cycle

Covestro looks at value creation cycles in their entirety – keeping sustainability in mind at all times.

Especially important to us is to:

- Enable improvements for our partners
- Enable savings and increase benefit
- Increase reusability



Our sustainability goals for 2025



Five goals for 2025



Align research and development with the UN sustainability goals



Apply own dedicated sustainability standards to all suppliers



Reduce own specific greenhouse gas emissions by 50%



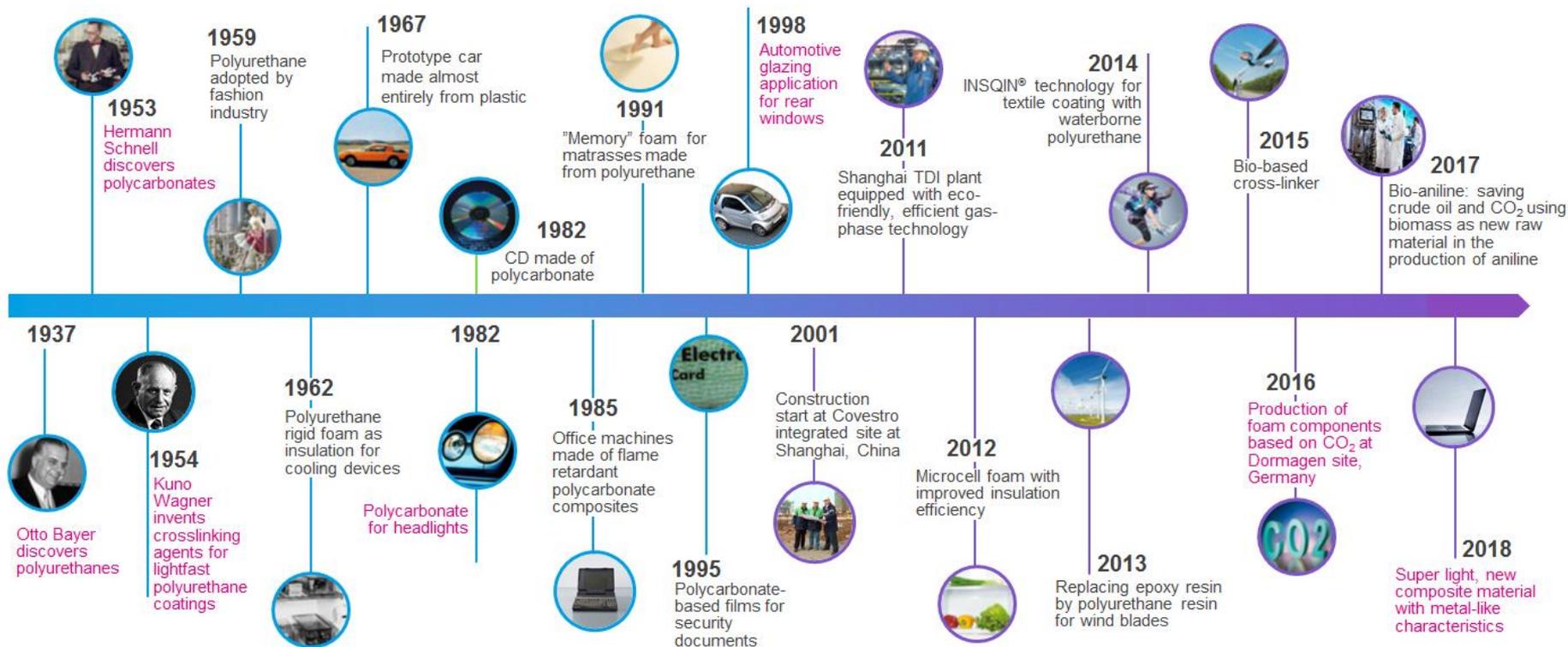
Improve living conditions of 10 million people in underserved markets



Use carbon in the most intelligent way



Our tradition of innovation



Our key industries in focus



Automotive
and
transportation



19%

Construction



17%

Wood and
furniture



18%

Electrics and
electronics



12%

Chemicals



8%

Sports/leisure,
cosmetics,
health and
others



26%

Why Covestro polycarbonates in automotive?

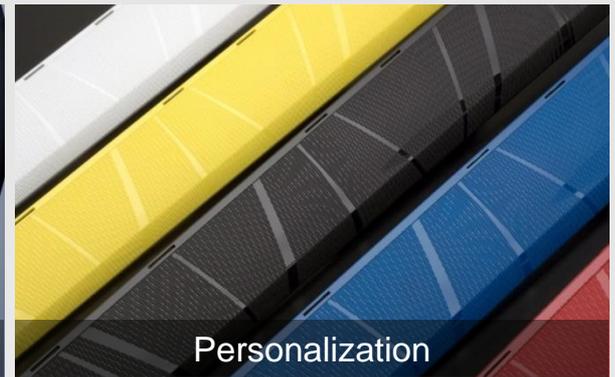
Advantages are balanced for multi-purpose needs



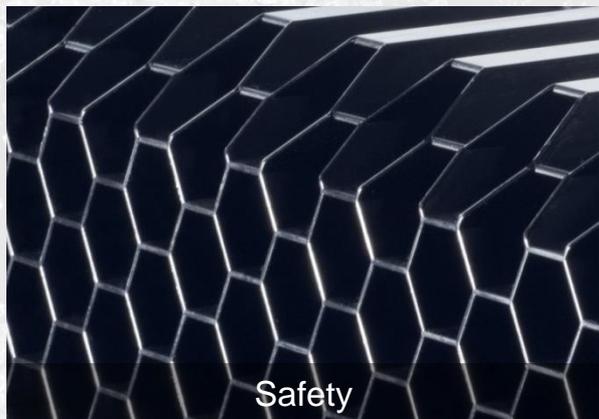
Design freedom



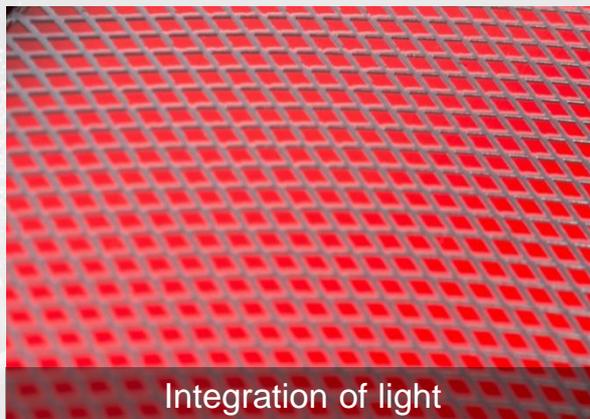
Functional integration



Personalization



Safety



Integration of light



Efficiency

What challenges of the future?

Cars will transform significantly tomorrow



Sensor and light integration in body



Living space like connected interior



New car architectures for electrified powertrain



What challenges of the future?

Cars will transform significantly tomorrow



Sensor and light integration in body



Living space like connected interior

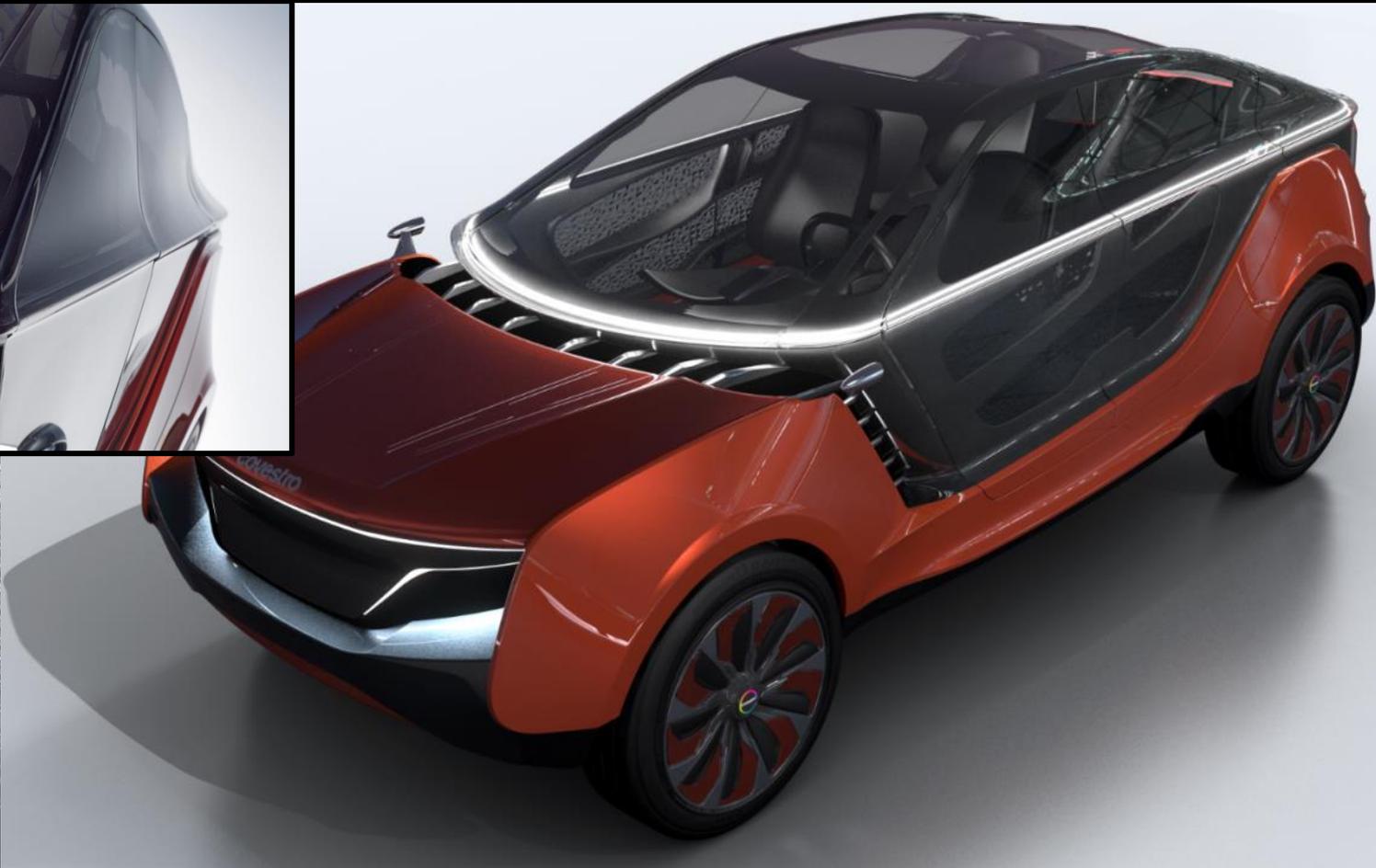


New car architectures for electrified powertrain



Lightweight of exterior design

Surfaces and car body are wrapped round by stylish polycarbonates



New functions on front design

Light and display are integrated with seamless design



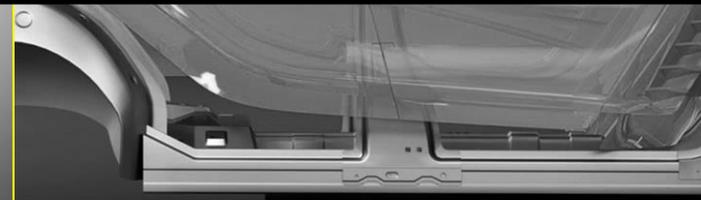
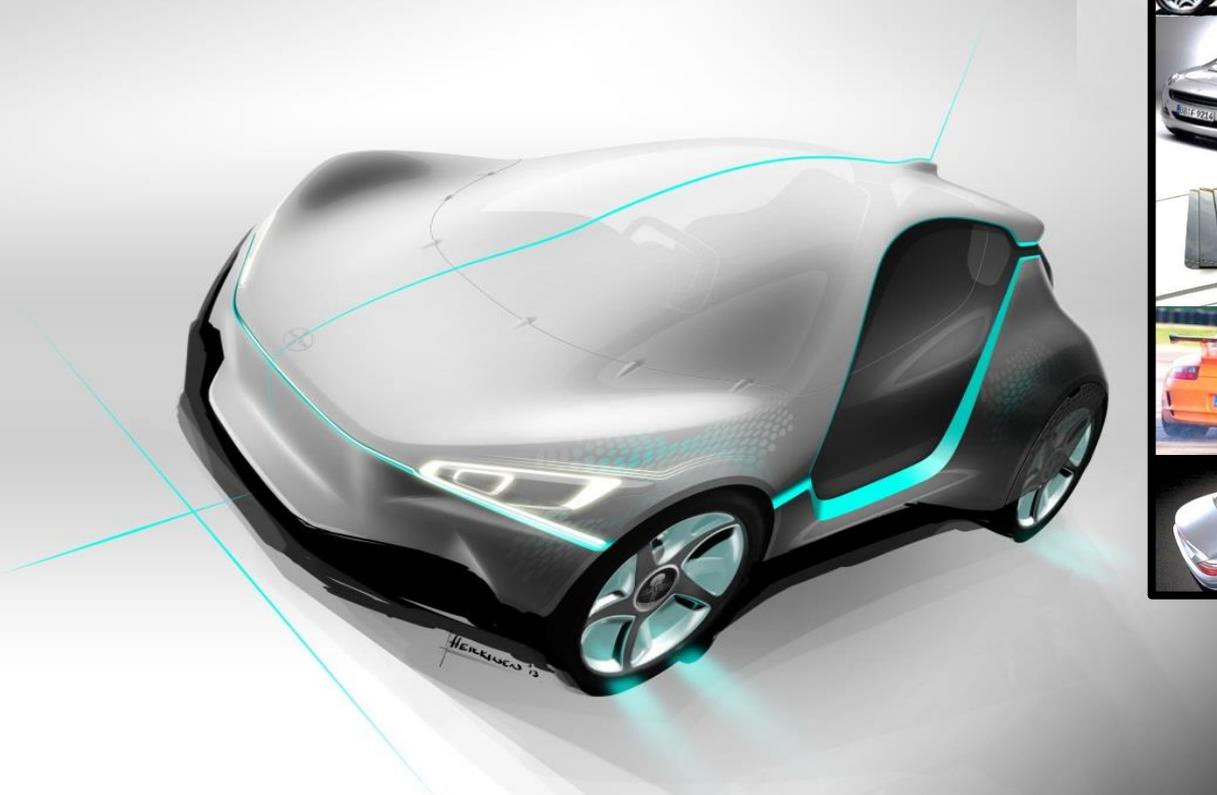
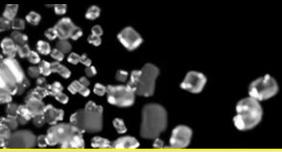
New design of tail gate

Tail gate becomes lighter and simpler



Future of polycarbonate car body

Electrification age booms disruptive styling design and engineering solutions



What challenges of the future?

Cars will transform significantly tomorrow



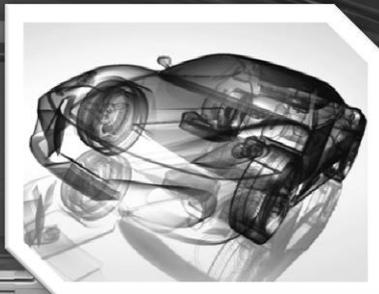
Sensor and light integration in body



Living space like connected interior



New car architectures for electrified powertrain



Interior design development

Automotive interior design develops from the past to the future



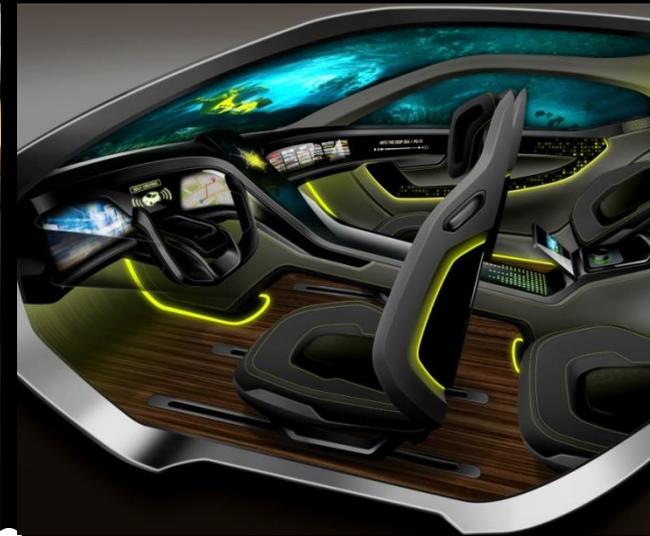
Yesterday

Function in focus
Mono-color



Today

Design in focus
Multi-surface



Tomorrow

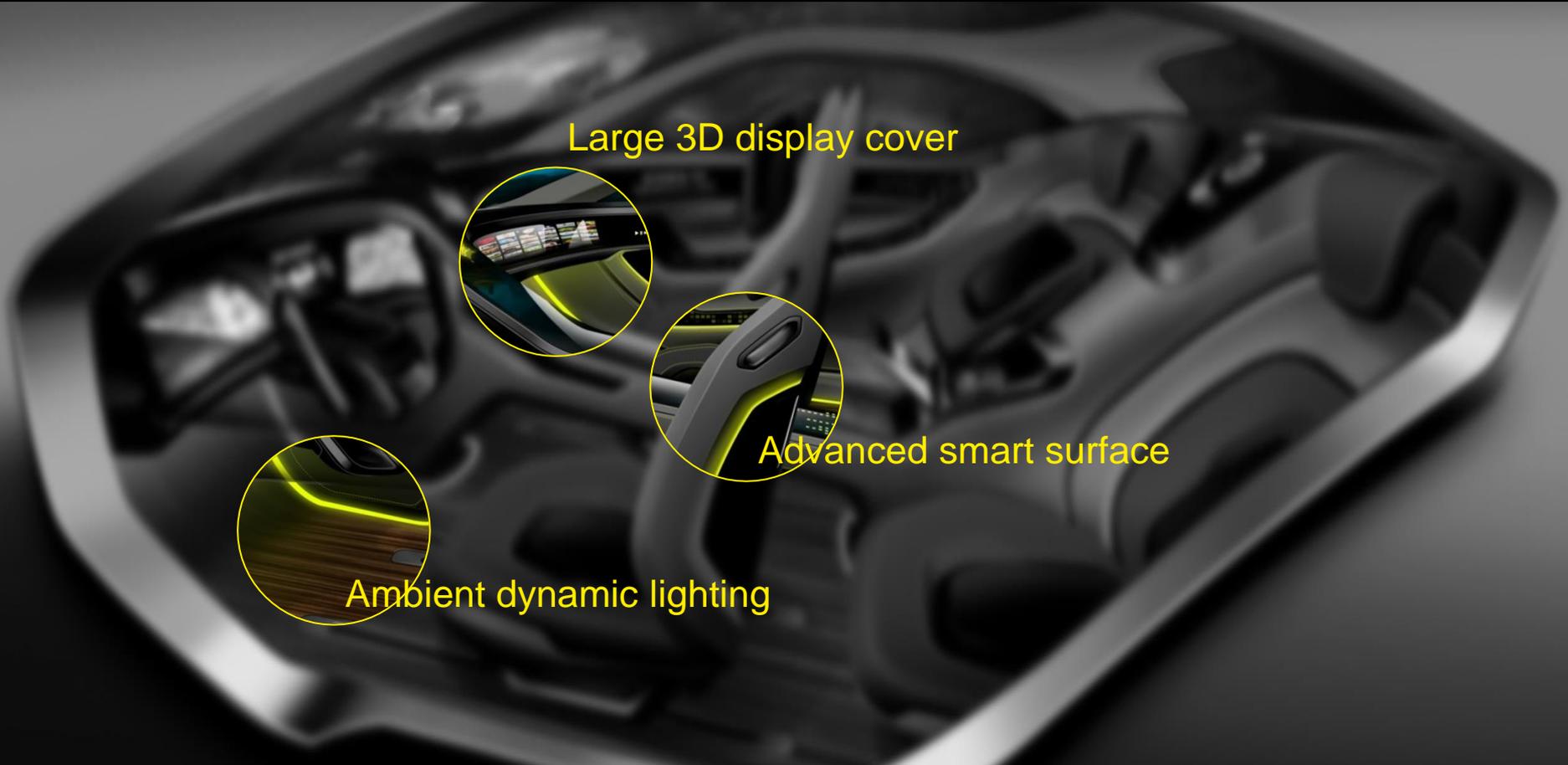
Space in focus
Multifunctional

Evolution

Revolution

Covestro concepts of the future

Our potential application fields in future automotive interior

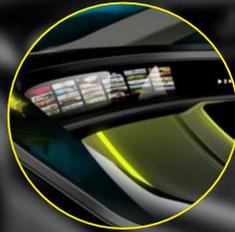


Our vision of large 3D display covers

Large 3D display cover allow to integrate interactive infotainment



Large 3D display cover



Our expertise in large 3D display covers

Large 3D Display Covers replace classical instrument cluster



- Definition:
Integration of Large 3D Display Covers largely replace classical instrument panels and create transparent infotainment
- Our expertise:
We provide materials and processing technologies that deliver
 - Design freedom
 - Optical quality
 - High gloss
 - Brilliant colors
 - Strong mechanical resistance

Large 3D display cover application examples

Overview of examples and products



Products

Makrolon® Ai

Makrofol® Film

Bayblend® MF



Our vision of ambient dynamic lighting

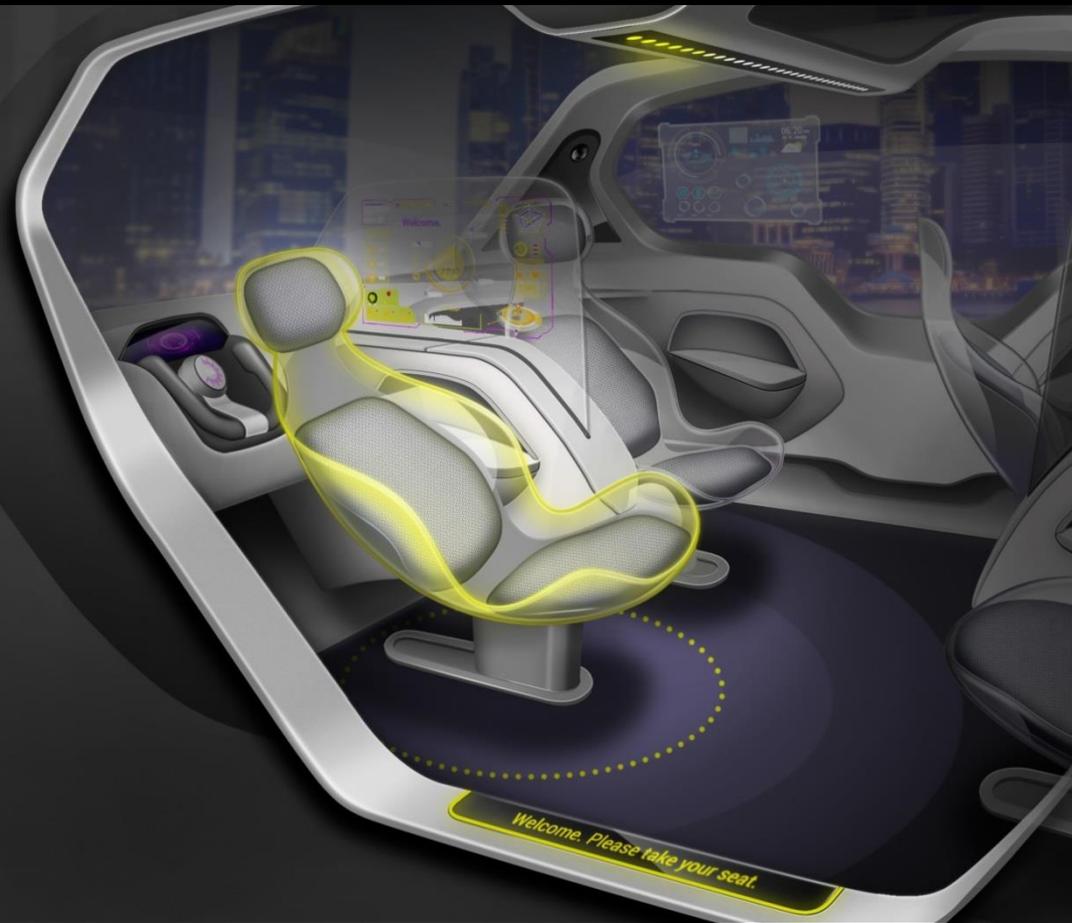
Ambient dynamic lighting amplifies interior feeling



Ambient dynamic lighting

Our expertise in ambient dynamic lighting

Ambient dynamic lighting intensifies interior space perception



- Definition:
Ambient dynamic lighting is a strong amplifier that creates a new and intensified interior space feeling
- Our expertise:
We provide materials that deliver
 - Translucent effect diversity
 - Translucent transparency
 - Broad applicability
 - Dimensional accuracy and stability
 - Optical quality
 - Global availability

Our creative lighting solutions

Bayblend® PG and Makrolon® Ai Translucent Color



Material and production benefits:

- Variety of material combinations
- Simplified production process through material combinations
- Outstanding heat resistance
- Strong toughness
- Easy flowing

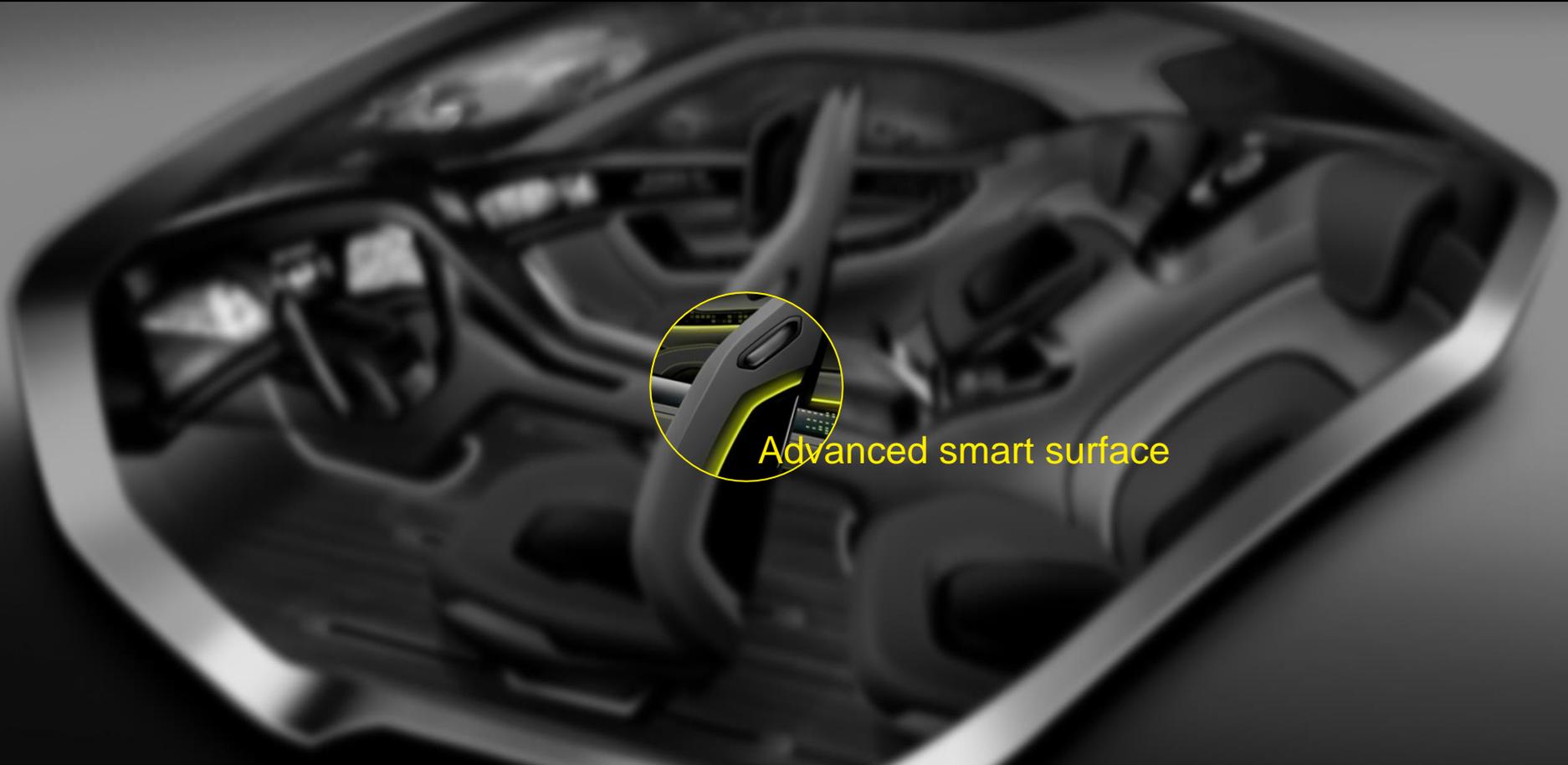
Products

Bayblend® PG (Plating Grade)

Makrolon® Ai Translucent Color

Our vision of smart surfaces

Smart surfaces enhance seamless interior design



Our materials enable unpainted parts of high quality

Makroblend® SR60 (PC+PBT)



Material and production benefits:

- Increased scratch and lotion resistance
- Good ductility at low temperatures
- High gloss with dynamic heat and cool technologies
- Low gloss with appropriate texturing or mold possible
- Cost-efficient production

Products

Makroblend® SR60

Touch functions with light integration in steering wheel



Polycarbonate film with printed 3D formable wiring for LED and touch function integration



Production benefits:

- Direct-Coating-PUR-RIM Technology enables virtually unlimited design freedom
- Only one production process enables various effect combinations
- Efficient production of coated components

Products

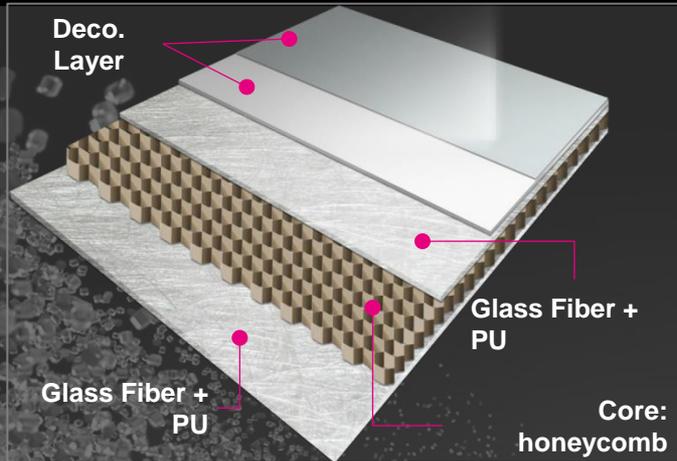
Makrolon® Ai Translucent Color

Bayblend® T

Baypreg® lightweight sandwich composites



A lighter but tougher panel for load floor



Spare Tyre Cover



Parcel Shelf



Load Floor

Production benefits:

- Low VOC
- Low density (200-400Kg/m³)
- High stiffness
- High dimension stability
- High design flexibility
- Internal de-molding

Products

Baypreg®

What challenges of the future?

Cars will transform significantly tomorrow



Sensor and light integration in body



Living space like connected interior

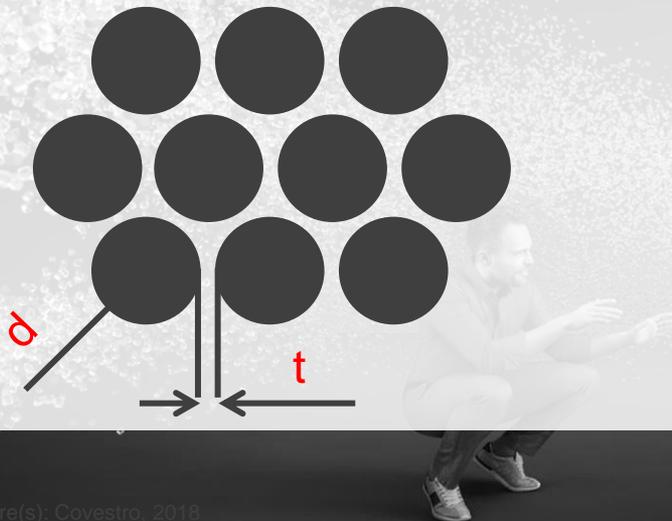
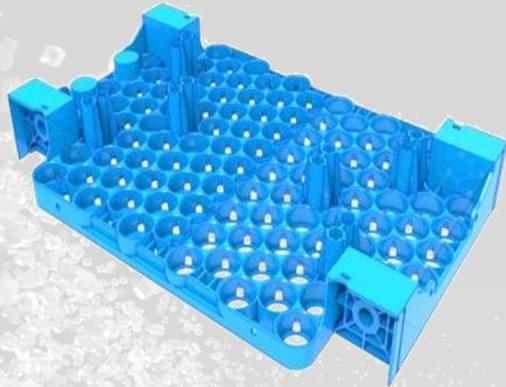


New car architectures for electrified powertrain



The thin-wall challenge

Case study: Cylindrical cell module



Energy content:

- Thousands of cells per car
- Thin-walled cell carrier to maximize energy density

Thin-wall challenge:

- Mechanical impact-resistance
- Dimensional stability
- Processability during injection-molding
- Flame retardancy

Modular battery systems: GreenPack

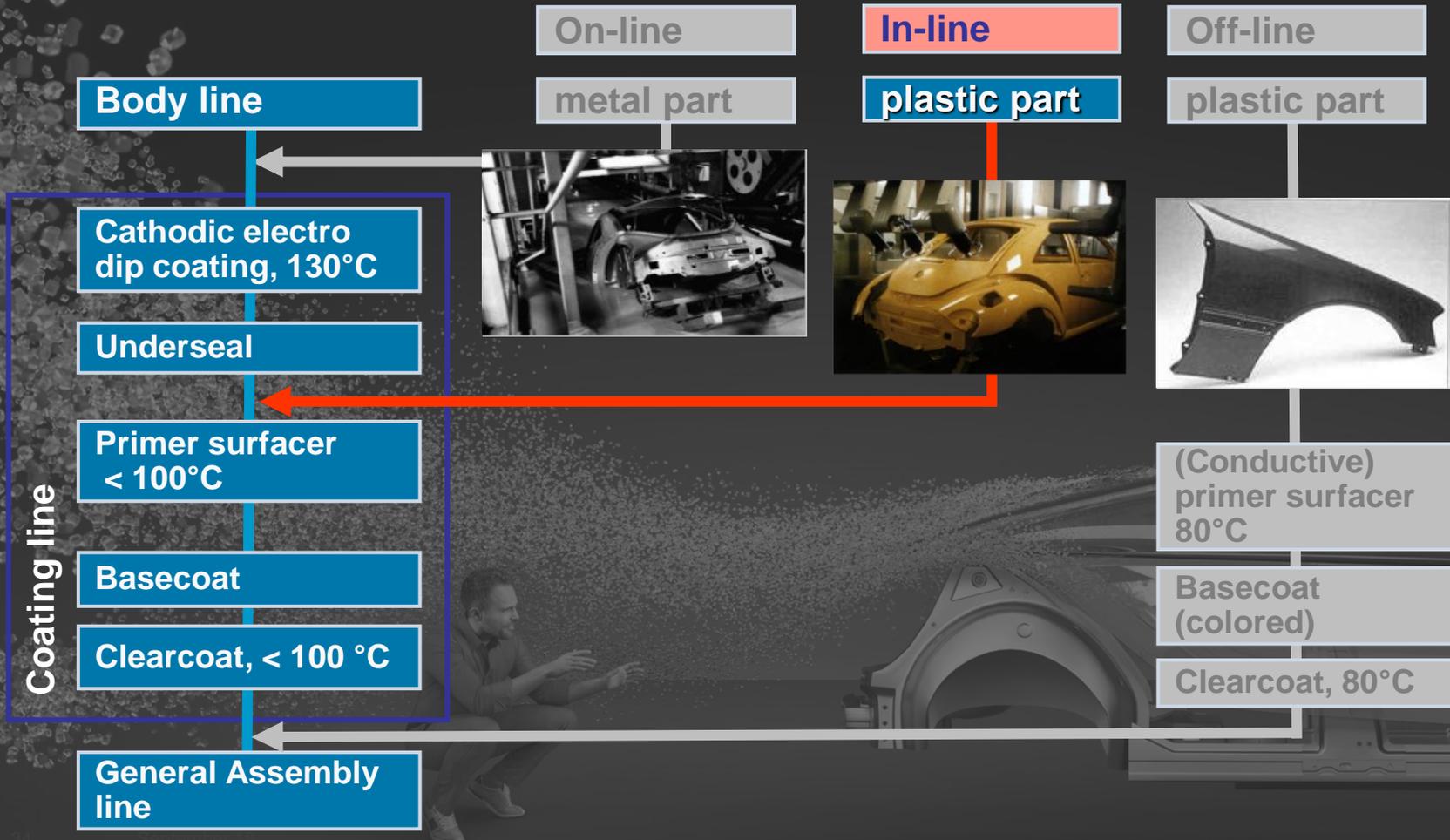
Portable standard module for electric transportation



Last but not least...



Benefit of low temperature painting process: In-line process with highest energy efficiency!



The challenge of green mobility in future

Design – Functions – Efficiency



- Future thermoplastic solutions fulfil specific design and functions
- New plastic developments with partners along the value chain
- Efficiency over the whole product life cycle



Forward-looking statements

This presentation may contain forward-looking statements based on current assumptions and forecasts made by Covestro AG.

Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in Covestro's public reports, which are available on the Covestro website at www.covestro.com.

The company assumes no liability whatsoever to update these forward-looking statements or to adjust them to future events or developments.