



Science For A Better Life

Meet Management in Tokyo

## Bayer MaterialScience

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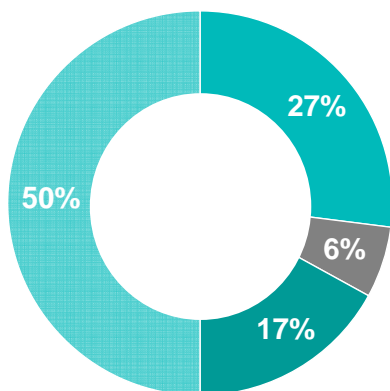
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# MaterialScience – Leading Positions in All Segments



Sales in € million

## Sales Split by Segment 2011



**MaterialScience €10,832m**

### Polyurethanes

€5,435m

■ #1-2; approx. 22-24% market share\*

### Polycarbonates

€2,893m

■ #1; approx. 27% market share

### Coatings, Adhesives, Specialties

€1,845m

■ #1; >40% market share\*\*

### Industrial Operations

€659m

# MaterialScience – High Performance Polymers



## Polycarbonates

- A transparent, tough and heat-resistant performance material
- Application in automotive (weight reduction)
- Construction (integrated heat and light management)
- Electronics & IT



## Polyurethanes

- Rigid foams for insulation in construction and along the cold chain
- Flexible foams for comfort applications
- Further applications include equipment housing or structural parts in automotive



## Coatings, Adhesives, Specialties

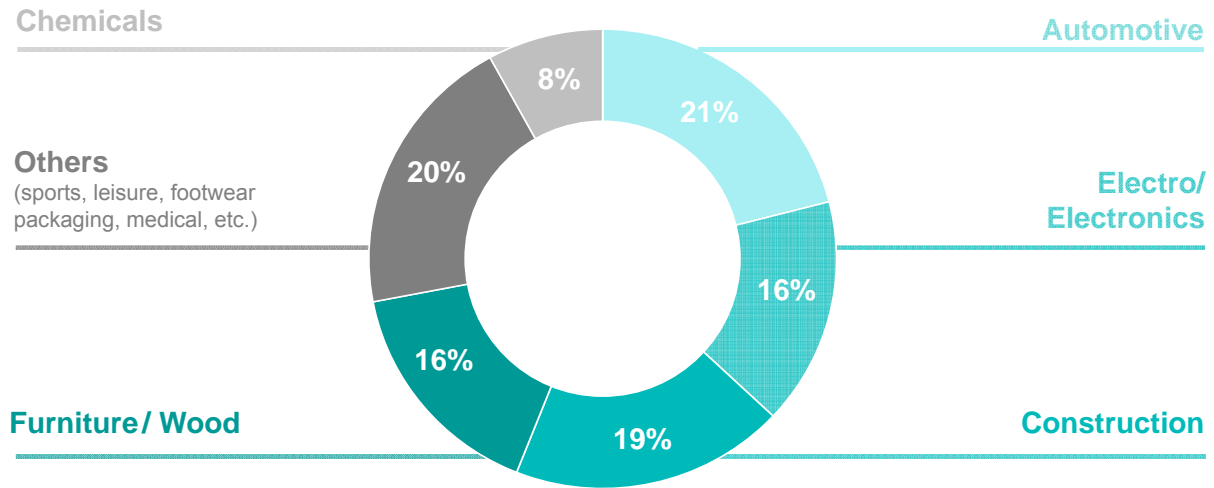
- Input materials for coatings and adhesives used for vehicles, industrial coatings, corrosion protection
- Functional films and development businesses



# MaterialScience – Sales By Key Customer Industries



Bayer MaterialScience sales by industry in 2011

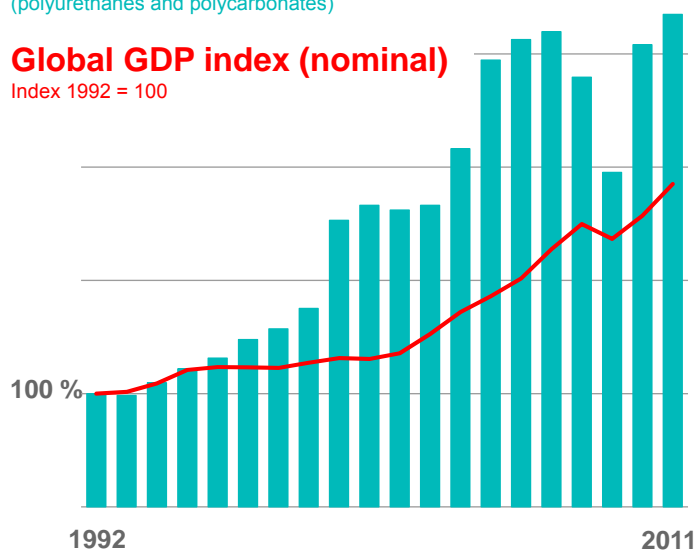


# Major Products Grow Above GDP on Average



## Major products sales growth (polyurethanes and polycarbonates)

**Global GDP index (nominal)**  
Index 1992 = 100



## Business Development

- Business growth: 1992-2011 CAGR: +8%
- Global GDP growth: 1992-2011 CAGR: +6%
- Major products performing above GDP growth
- Historically, long-term growth trend intact across the business cycles
- Growth trend expected to continue as global megatrends need sustainable solutions

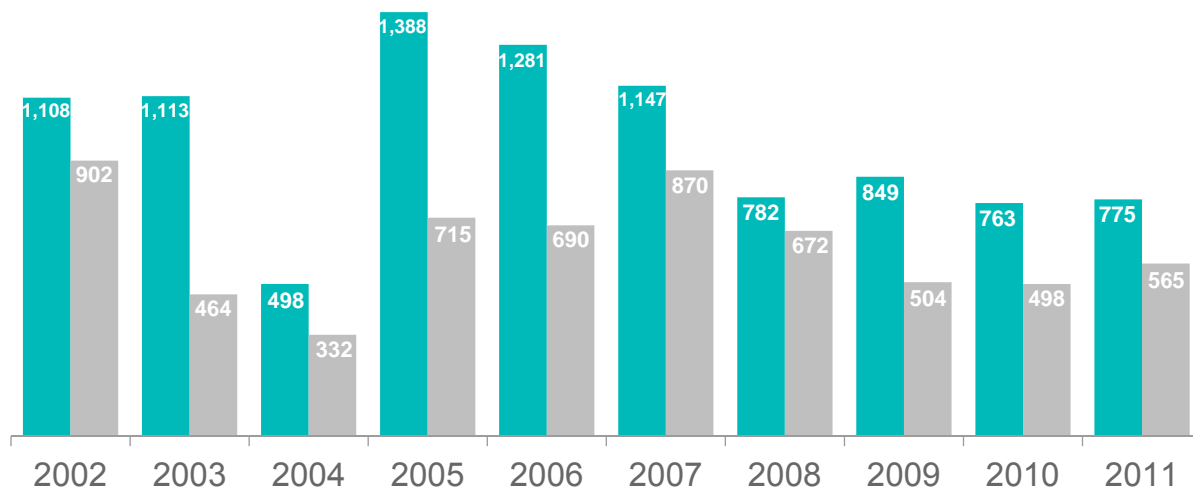
# Cash Generation in Excess of Own Investment Need



In € million

■ Net Cash Flow  
■ CapEX (cash-relevant)

~€3.5bn Free Operating Cash Flow in 10 years



2002 and 2003 as reported in 2004 excluding acquisitions or divestments

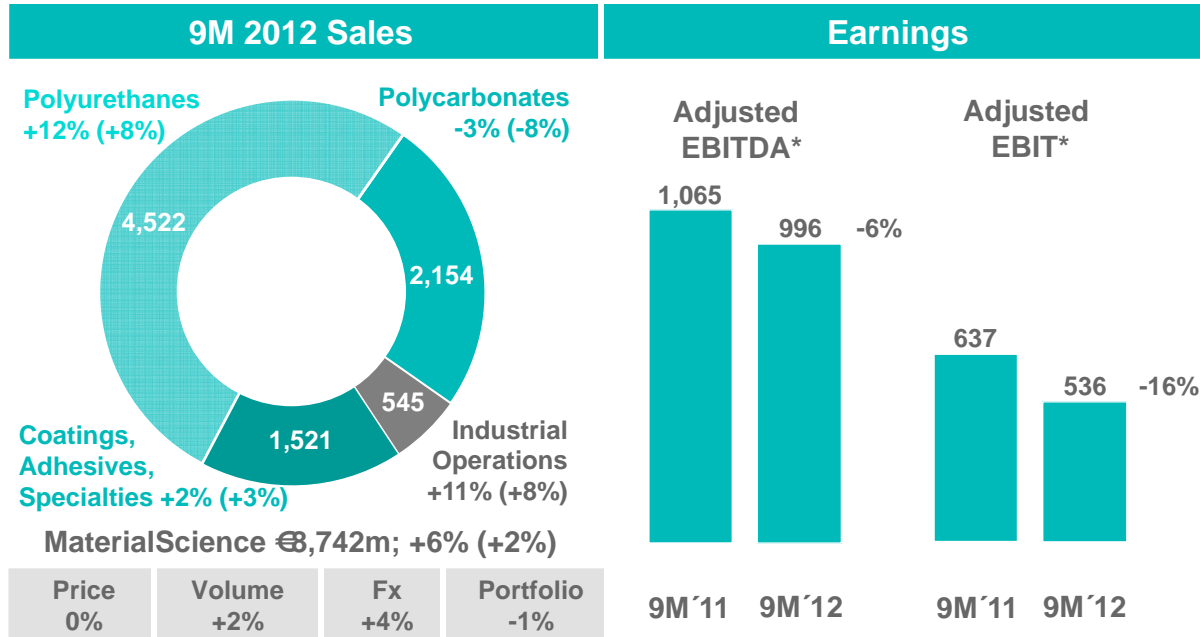


## 9M 2012 Further Sales Growth

# 9M 2012 – Operating Performance



Sales in € million; Δ% y-o-y, () Fx & portfolio adj.

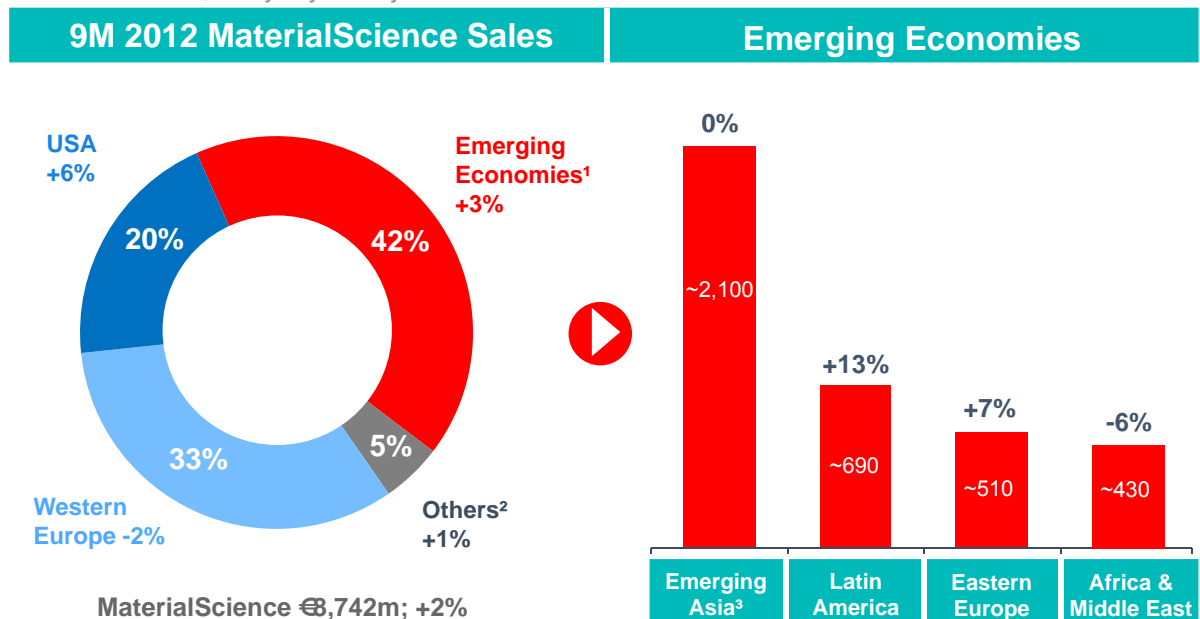


\* before special items

# 9M 2012 – Regional Sales Development



Sales in € million; Δ% y-o-y Fx adjusted



<sup>1</sup> Emerging economies include: Latin America, Asia w/o Japan, Australia, New Zealand, Africa and Middle East incl. Turkey, Eastern Europe <sup>2</sup> Others = Japan, Australia, New Zealand, Canada <sup>3</sup> Emerging Asia = Asia without Japan, Australia, New Zealand

# Fiscal 2012 – Business Outlook

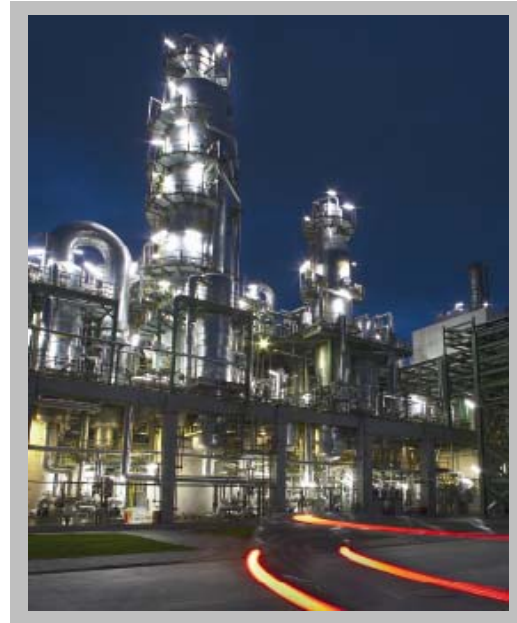


## Q4 2012 Outlook

- We aspire to achieve Fx- and portfolio-adjusted sales and EBITDA before special items well above the weak level of the same quarter last year

## FY 2012 Outlook

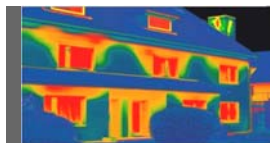
- We forecast Fx- and portfolio-adjusted sales slightly above prior year and EBITDA before special items to remain level with the prior year



# Capitalize On Global Megatrends



# Capitalize on Global Megatrends and Spur Future Growth



## Urbanization – Increasing Energy Consumption

Buildings are responsible for more than 40% of global energy use\*



## Globalization – Increase in Greenhouse Gas Emissions

14% of greenhouse gases worldwide origin from the transport of goods, making it the third largest emission source\*\*



## Mobility – Increasing Noise Pollution

About 30% of the EU population are exposed to road traffic noise in excess of 55 dB(A) during night time\*\*\*

\*Source: UNEP, Sustainable Buildings and Climate Initiative

\*\*Source: World Resources Institute

\*\*\* WHO recommends less than 30 dB(A); dB(A): A-weighted decibel quality

# Polyurethane-based Insulation for Residential & Commercial Buildings



## PUR Isoboards for Thermal Insulation

- For buildings
- Highest thermal insulating capacity relative to wall thickness, easy to apply

## PUR Metal Sandwich Panels

- Prefabricated and mainly applied for industrial and commercial buildings
- Easy handling and fast site assembly
- High energy efficiency for cold storage

## Growth drivers

- EU: From 2020 on, new buildings have to be constructed as “nearly zero-energy buildings”
- US: New standard requires 30% less energy use for renovated homes and commercial buildings
- 1 kg polyurethane saves 360 to 755 kg CO<sub>2</sub> emissions\*
- PUR in construction industry in 2011: approx. €4.8bn, estimated average growth rate of ~8% p.a.

\*Additional insulation, savings over entire product life-cycle of 50 years, including production and end-of-life stages; PUR: polyurethane

# Polycarbonate Sheets for Heat Management in Buildings



## Polycarbonate Multi-Wall Sheets

- Combined light and heat management to reduce energy requirements
- Significant reduction of CO<sub>2</sub> emissions
- Integration of solar energy panels
- Good weather stability
- Advantages over glass: Design freedom, safety, weight

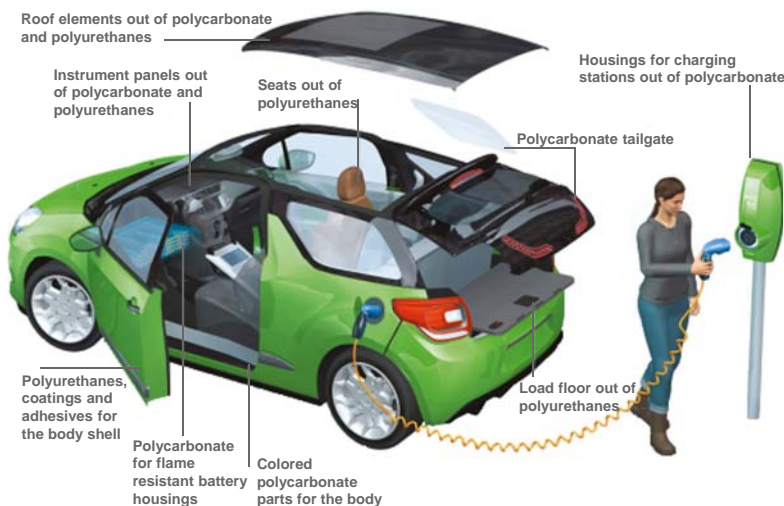
## Growth drivers

- Growing demand for non-electrical indoor climate control
- Translucency levels of 65-85%, ensure the maximum amount of daylight inside buildings
- Makrolon® meets international fire protection requirements (not self-igniting)
- Global market size 2011 approx. 45 kt, estimated average growth rate of ~10% p.a.

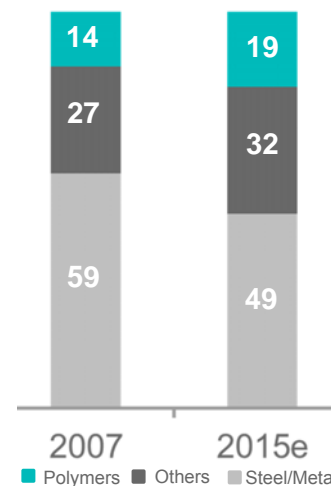
# Examples of Bayer's Materials for Energy Efficient Cars



## MaterialScience's Solutions for Saving Weight



## Development of material share in %\*



\* Based on an average automotive weight of 1,300 kg



# Increased Energy Efficiency in Cars Through Polycarbonates



## Polycarbonates

- Heat stability and optical quality enable new LED-based lighting systems
- Flame-retardant polycarbonate blends protect batteries used in future cars with hybrid engines
- Car body parts made from polycarbonate blends reduce weight
- Automotive glazing out of polycarbonate combines high weight saving potential with outstanding thermal insulation

## Growth drivers

- Broad global political initiatives promoting e-mobility
- Increasing use of electrical devices requires flame retardancy of plastics
- Polycarbonate glazing offers a weight advantage of 30-50% compared to real glass
- 77m light vehicles\* produced globally in 2011, estimated average growth rate of 5-6% p.a.

# Noise Reduction in the Transportation Sector



## Polyurethane

- Durflex® track system stabilizes ballast stones with polyurethane foam
- Creates a durable track system with long-term elasticity
- Combines the advantages of ballast track (elasticity & dampening effect) and of slab track (durability)
- Improves the economics of track operations
  - Reduces maintenance costs
  - Increases track availability

## Growth drivers

- Noise absorption of up to 3dB(A)
- Reduction of vibrations by approx. 40%
- 1.37 million km rail network worldwide
- Especially for busy high-speed passenger and heavy cargo routes



# Focus on Key Strategic Projects

## A Leader in Process Technology, Competitiveness and Sustainability



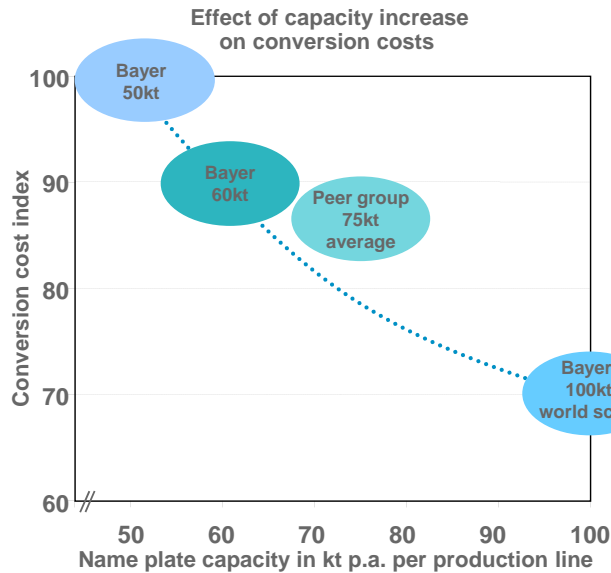
	TDI Gas Phase Phosgenation	Adiabatic Aniline Production	ODC Technology for Chlorine Production
Process			
Benefits*	<ul style="list-style-type: none"> <li>● Uses up to 60% less energy</li> <li>● Requires 80% less solvent</li> <li>● CapEx reduced by 20%</li> </ul>	<ul style="list-style-type: none"> <li>● Uses 25% less energy</li> <li>● 20% less CO<sub>2</sub> emissions</li> <li>● CapEx reduced by 30%</li> </ul>	<ul style="list-style-type: none"> <li>● Uses 30% less energy</li> <li>● Reduces indirect CO<sub>2</sub> emissions</li> </ul>
Status	<ul style="list-style-type: none"> <li>● World-scale facility since 2011 in Shanghai, China</li> <li>● Technology to be used in new TDI plant in Dormagen</li> </ul>	<ul style="list-style-type: none"> <li>● Pilot plant in Antwerp, Belgium</li> <li>● Plant in Shanghai since 2010</li> </ul>	<ul style="list-style-type: none"> <li>● Demo facility in Krefeld-Uerdingen</li> <li>● External marketing planned from 2013</li> </ul>

\*Compared with conventional technology  
ODC: Oxygen depolarized cathode

# World Scale in Polycarbonates Production Reduces Costs Through Economies of Scale



## Bayer Has a Competitive Production Line Concept in All 3 World Regions



**Bayer is the only PCS producer that runs highly efficient, single 100kt lines**

### 100kt lines are operated in:

- 2002 Map Ta Phut, Thailand (first 100kt line worldwide)
- 2003 Uerdingen, Germany
- 2006 Caojing, China
- 2009 Caojing II, China

+ Further expansion of Caojing

# Build on European Market Leadership With Further Investments



## €100m in Capital Expenditures Planned in Germany

- Investments focused on meeting growing local demand
- New facilities use innovative process technologies for more efficient production
  - New multipurpose plant for HDI and IPDI by 2013
  - New 300kt/year TDI plant\* by 2014
  - Expansion of MDI capacity by 220kt/year (timing t.b.d.)
  - Expansion of PCS capacity by 100kt/year (timing t.b.d.)
  - Chlorine production unit with new oxygen depolarized cathode technology



\* Construction of a new 300kt/year TDI facility replacing existing 205kt IPDI: isophorone diisocyanate, MDI: methyl diphenylene diisocyanate, TDI: toluene diisocyanate, HDI: hexamethylene diisocyanate, PCS: polycarbonate

# Grow in China by Expanding Bayer's Largest, Fully Integrated Site in Shanghai



## Strengthening Leadership Through Further Local Production and Know-how

- Second investment stage
  - Increase MDI capacity to 1,000kt/year
  - Increase PCS capacity to 500kt/year
  - Increase HDI capacity, new 50kt line planned
  - New IPDI line planned
- PCS headquarters transferred to Shanghai mid 2011
- Expansion of local R&D activities

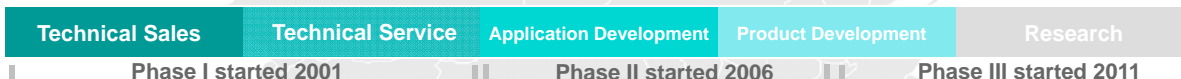
PUR	PCS	CAS
<b>MDI</b> 350 kt in 2011 +650 kt	<b>PCS</b> 200 kt in 2011 +300 kt	<b>HDI</b> 30 kt in 2011 +50 kt
<b>TDI</b> 250 kt in 2011		



# Getting Closer to Our Customers – Polymer R&D Center Shanghai



- Broad service range:
  - Technical service/help
  - Customer training programs
  - Specialized laboratories for product and process R&D



- Phase III expansion part of our €1 billion investment program
- Number of employees expected to double from currently 130
- Provides a full range of R&D expertise



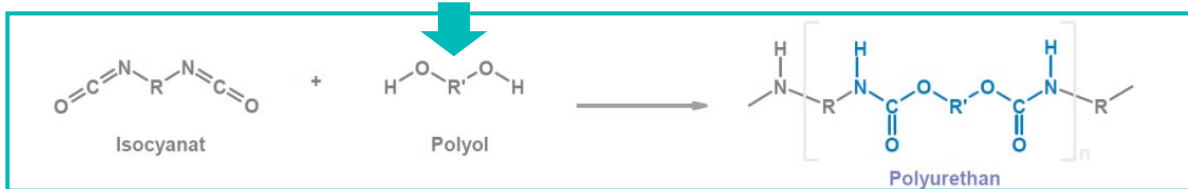
# Sustainable Production – Making Carbon Dioxide a Feedstock



- Production of high quality polyurethane foam with the help of carbon dioxide (CO<sub>2</sub>)
- Oil partly replaced by CO<sub>2</sub>, reduced raw material costs
- Unique technology, good properties of final (foam) products
- Pilot plant started operating in Germany in 2011
- Project partnered with RWE (supplies CO<sub>2</sub>) and RWTH Aachen
- Industrial production expected to start 2015 earliest
- The “Dream Production” project receiving governmental funding



## CO<sub>2</sub> as Feedstock



## Summary



- Leading positions in all business segments
- Excellent versatility of high performance materials
- Growing above GDP on average, yet a cyclical business
- Global megatrends expected to spur future growth
- Committed to further optimize worldwide production network
- Leading in process technology, with further innovations underway
- Future investments to focus on key strategic projects