Petrochemicals
The Heart of BASF’s Verbund

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Investor Day
Chemicals segment

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Key success factors:

▶ Cost advantages through feedstock flexibility
   Example: Port Arthur cracker,
   On-purpose propylene production

▶ Global footprint with focus on emerging markets
   Example: Acrylic acid Nanjing, China and Camaçari, Brazil

▶ Technology leadership
   Example: Isononanol Maoming, China

▶ Outstanding plant performance through operational excellence
   Example: Acrylic acid process optimization
Petrochemicals accounts for 11% of BASF Group’s third-party sales

BASF Group third party sales 2013

- Functional Materials & Solutions: 23%
- Agricultural Solutions: 7%
- Performance Products: 21%
- Petrochemicals: 11%
- Chemicals: 23%
- Oil & Gas: 20%
- Other: 6%

€74 billion
BASF Petrochemicals – “Heart of the Verbund”

Our mission “Excellence in Petrochemicals”

Reliable partner and supplier

- to BASF’s value chains
- to external customers
**BASF Petrochemicals – Portfolio**

<table>
<thead>
<tr>
<th>Cracker products</th>
<th>Acrylic acid</th>
<th>Alcohols &amp; Derivatives</th>
<th>Alkylene oxides &amp; Glycols</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2: #14 globally</td>
<td>Acrylic acid: #1 globally</td>
<td>Oxo alcohols: #1 globally</td>
<td>EO &amp; glycols: #2 in Europe</td>
</tr>
<tr>
<td>C3: #13 globally</td>
<td></td>
<td>Solvents: #2 Europe</td>
<td>PO &amp; glycols: #3 in Europe</td>
</tr>
</tbody>
</table>

**Main Competitors**

- Exxon Mobile
- Sabic
- Ineos
- Evonik
- Shell
- Dow
- Sinopec
- Eastman
- Nippon Shokubai
- Lyondell Basell
- Arkema

(#): Market position in 2012
BASF Petrochemicals
The starting point for BASF’s downstream businesses

Cracker products & Industrial gases

BASF SE, Steamcracker Antwerp, Belgium

Acrylcahs

Alcohols & Deriv.

Alkyene Oxides

Market
- Plastics & Rubber
- Construction
- Automotive
- Food
- Agriculture
- Chemical Ind.

BASF Verbund
- Performance Products
- Functional Materials & Solutions
- Agricultural Solutions
- Chemicals

* Volume
**BASF Petrochemicals**
The starting point for BASF’s downstream businesses

**Cracker products**
- Ethylene
- Propylene
- Raffinates
- Butadiene
- Benzene

- **Acrylics**
  - Acrylic acid
  - Standard acrylates
  - Specialty acrylates

- **Alcohols & Deriv.**
  - Butanol
  - C8/C9/C10 alcohols
  - Solvents
  - Hexamoll® DINCH®

- **Alkylene Oxides**
  - Ethylene oxide
  - Propylene oxide
  - Glycols & specialties

**Market**
- Plastics & Rubber
- Construction
- Automotive
- Food
- Agriculture
- Chemical Ind.

**BASF Verbund**
- Performance Products
- Functional Materials & Solutions
- Agricultural Solutions
- Chemicals

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*Volume*
BASF Petrochemicals
Strong global footprint

Production sites

- Antwerp
- Moerdijk
- Singapore
- Geismar
- Freeport
- West Memphis
- Pasadena
- Cornwall
- Port Arthur
- Ludwigshafen
- Tarragona
- Meaux
- Camaçari
- Guaratinguetá
- Nanjing
- Maoming
- Kuantan
- Singapore

Under construction

Steam cracker

Specialties
BASF Petrochemicals
Strong global footprint, strong partnerships
BASF Petrochemicals
Business development

Consolidated sales
in billion €

Key facts
- IFRS 10/11 impact on sales: Verbund site Nanjing, China and Tarragona, Spain are only accounted for at-equity (Sales: -€1.5 billion)

- Profitability:
  - In 2008 & 2009, earnings drop due to global economic crisis
  - In 2010/2011, peak margins in several businesses supported by product shortage
  - In 2013, significant earnings improvement
BASF Petrochemicals
Significant investments to build a global asset base (2000-2013)

**Kuantan**
Joint Verbund site
BASF & Petronas

**Port Arthur**
Sabina C4-Complex
(JV with Total & Shell)

**Antwerp**
Steam cracker expansion

**Nanjing**
Expansion of Verbund site

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**New Steam cracker**
(JV with Total)

**2000 2001**

**2004 2005 2006 2007**

**2008 2009 2010 2011 2012**

**Port Arthur**
Joint Verbund site
BASF & Sinopec

**Nanjing**
Acrylic acid plant

**Antwerp**
HPPO Antwerp
BASF Petrochemicals
Investing in profitable growth

Port Arthur
- Improvement of feedstock flexibility/capacity increase

Camaçari
- New acrylics complex (AA, BA)

Ludwigshafen
- Expansion syngas plant

Maoming
- New world-scale isononanol plant

North America
- On-purpose propylene production

2013
- New Hexamoll® DINCH® plant

2014
- New acrylics complex

2015
- New butadiene extraction unit

2019
- Expansion EO plant
BASF Petrochemicals
Regional differences

**Europe**
- Low growth
- High raw material costs
- High energy costs
- Strengthen competitiveness via Verbund, Innovation, Tech. leadership, Operational excellence

**North America**
- Moderate growth
- Competitive raw materials due to shale gas
- Invest in feed flexibility: benefit from shale gas, Strengthen downstream competitiveness

**Asia, South America**
- High growth
- Limited access to oil and gas, Coal, renewables
- Invest in emerging markets to support downstream growth via strategic partnerships

**Middle East**
- Low growth
- Favorable feedstock conditions, Limited local demand
- No petrochemical Verbund investments foreseen

**BASF Feedstock**
- Favorable feedstock conditions
- Limited local demand
- Competitive raw materials due to shale gas
Shale gas boom in the US
Significant advantage through lower energy and feedstock cost

Key facts

- Increased US shale gas production disconnects crude oil prices from natural gas prices in North America
- Production of natural gas liquids (NGLs) such as butane, propane, ethane increases
- NGL price drop drives shift to lighter cracker feed slates, defining cracker competitiveness

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Shale gas boom in the US
Feedstock cost advantage lifts cracker margins

Key facts
- US cracker margins expected to stay strong
- Light feedstock continue to be advantaged
- Naphtha cracker margins likely to improve
- Feedstock flexibility is key for profit maximization

US Cracker margin
Naphtha Margin in year 2000 = 100, normalized

Source: BASF
Driving the Port Arthur cracker to be best in class in North America

Kerosene, Diesel, Gasoil

Condensate Splitter

Steam Cracker

C4 Complex

Butenes

Ethylene

Propylene

Butadiene

Alkylate

Aromatics
Driving the Port Arthur cracker to be best in class in North America

Timeline
- **2009**: Butane feed established
- **2013**: Feed capability expanded to ethane
- **2014**: Capacity expansion through addition of 10th furnace
- **2015**: Increase of ethane import capability

Key facts
- World-scale cracker*: 1,040,000 mt/a ethylene
- Today, up to 90% light feedstock (ethane, propane, butane)
- Feedstock optimization on a day-to-day basis

Modification of cracker allows for full feedstock flexibility

* Joint venture: 60% BASF, 40% Total S.A.
Benefiting from shale gas in North America
On-purpose propylene production

Key facts

- Propylene to methane spread expected to increase
- World-scale propylene plant based on competitive shale gas
- Methane-to-methanol-to-propylene technology
- Best-in-class technology – up to 20% lower total cost compared to next best technology
- Start-up planned for 2019
- Replacement of propylene purchases through own production
- Strengthen C3 value chain

Significant improvement in EBITDA
BASF position in acrylic acid market

Key facts

- Largest producer of acrylic acid worldwide
- BASF capacity: 1,350,000 t/a*
- Market size of 5,300,000 t/a (in CAA** eq.)
- Acrylic acid demand expected to grow above GDP (2013-2020)
- Growth driven by emerging markets; rising middle class leads to increased demand for diapers, coatings & paints, adhesives, construction, textiles

Source: BASF; * including new plant at BASF-YPC Nanjing; ** crude acrylic acid
Continuous process innovation leads to best-in-class technology

Acrylic acid cash cost curve, China average cash costs 2014

BASF with best-in-class acrylic acid process

- Proprietary technology, new process
- Leveraging BASF’s catalyst expertise; highly selective and efficient process catalysts
- Lower energy consumption
- Continuous productivity improvements; smart production increase by run-time extension and higher throughput
- Investment projects earn cost of capital even at hypothetical marginal producer price level
Participating in emerging market growth
Construction of world-scale acrylic acid plants in China & Brazil

Nanjing, China
- World-scale acrylic acid plant: 160,000 mt/a
- Start-up in April 2014

Camaçari, Brazil
- World-scale acrylic acid plant: 160,000 mt/a
- Start-up planned for Q4 2014

Key facts
- High BASF internal demand
- BASF as first mover in Brazil
- Proprietary, best-in-class technology
- Significant cost synergies due to twin projects

BASF ensures No. 1 position in acrylic acid
Access to emerging markets via technology leadership

Strengthen BASF’s position for higher oxo-alcohols

Key facts

- World-scale isononanol (INA) plant in Maoming, China*
- Proprietary technology
- Start-up planned for 2015
- Integrated into SINOPEC’s refinery and petrochemical complex
- First mover advantage
- Participate in strong market growth for next generation plasticizers in China such as DINP and Hexamoll® DINCH®

* Joint venture: 50% BASF, 50% SINOPEC
Leveraging technology leadership
Cost structure of new higher oxo-alcohols plant in China

Isononanol & 2EH** cost comparison, 2013
2EH producers = 100, normalized

Key facts
- World-scale isononanol (INA) plant in Maoming, China*
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BASF Isononanol economics below 2EH cash-cost level

Source: BASF internal  * Joint venture: 50% BASF, 50% SINOPEC; ** 2-Ethylhexanol
Operational excellence

Key focus areas

- Process and catalyst optimization improving yields
- Reduced energy consumption in production
- Dedicated team for asset and turn-around management
- Design of special equipment (special reactors, divided wall columns)
- Smart debottlenecking with low or no investment

Double digit million euros savings every year

BASF SE, Acrylic acid plant, Antwerp, Belgium
Operational excellence
Continuous improvement ensures cost leadership for acrylic acid

Key facts

- Optimization of process parameters lead to:
  - increased on-stream factor
  - higher production (+15%) w/o additional investment
  - lower energy consumption
  - reduced CO2 emissions

Lower specific investment increases competitiveness
**Operational excellence**

Despite significant investments fixed costs increased only slightly

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**BASF Petrochemicals 2004-2013 Index**

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**Key facts**

**Sales impact of IFRS 10/11 changes**

- Verbund site Nanjing, China and Tarragona, Spain are only accounted for at-equity (Sales: -€1.5 billion)

- CAGR 2004 – 2013
  - Sales: 5.5%
  - Fixed Costs: 1.3%
BASF Petrochemicals will continue to grow and optimize EBITDA

Consolidated sales in billion €

Business outlook

- Sales growth based on increasing global footprint with focus on emerging markets
- Petrochemicals will continue to optimize EBITDA via:
  - Cost advantages through feedstock flexibility
  - Global footprint
  - Technology leadership through innovation
  - Operational excellence
Key take-aways:

- Cost advantages through feedstock flexibility
- Global footprint with focus on emerging markets
- Technology leadership
- Outstanding plant performance through operational excellence