BASF’s Catalysts Division: The Global Leader in Catalysis

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Catalysts – a strategic fit for BASF

BASF Group third party sales 2013

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

Total: €74 billion

thereof Catalysts: 8%
1 | BASF a market leader in catalysts

2 | Strategy for growth in core business units

3 | Emerging opportunity in Battery Materials
BASF has strongest portfolio in the industry – catalysts, materials, services

**Mobile Emissions Catalysts**
- Emissions-control catalysts for cars, trucks, motorcycles

**Chemical Catalysts**
- Chemical and polyolefin catalysts plus adsorbents

**Refinery Catalysts**
- FCC* catalysts and additives for oil refining

**Battery Materials**
- Current and next-generation battery materials development

**Precious Metal Services**
- Full-loop metals distribution, financial services, recycling

**New Business Development**
- New “white space” ventures in areas such as clean air and catalytic coatings

* FCC - Fluid catalytic cracking catalysts
Global megatrends drive catalysts demand

We create chemistry for a sustainable future

<table>
<thead>
<tr>
<th>Air quality</th>
<th>Process efficiency</th>
<th>Energy efficiency</th>
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<tbody>
<tr>
<td>Mobile emissions regulations</td>
<td>Shift in desired industrial output</td>
<td>Clean and efficient use of crude oil, natural gas, coal and feedstock</td>
</tr>
<tr>
<td>Fuel &amp; environmental regulations</td>
<td>Raw material change</td>
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Innovation and technology are the keys to success in the catalysts market
BASF – The # 1 global catalysts solutions provider
Strong catalysts portfolio – leveraging BASF’s leading technology position

Total sales 2013
in € billion

Underlying sales 2013
in € billion
w/o “Precious & Base Metal Services” and precious metals

Mobile Emissions Catalysts
2.3

Precious & Base Metal Services
2.4

Mobile Emissions Catalysts
1.3

Refrinery Catalysts
0.3

Chemical Catalysts
0.6

Refrinery Catalysts
0.3

Chemical Catalysts
0.6

€5.7* billion

€2.3* billion

* Including €0.1 billion in other sales
Balanced sales base

Sales 2013 by region*

- South America, Africa, Middle East: 11%
- North America: 35%
- Europe: 30%
- Asia: 24%
- Europe: 30%

Sales 2013 by industry*

- Transportation: 55%
- Chemicals: 27%
- Refinery: 14%
- Other: 4%
Global manufacturing footprint, with close customer proximity

Significant increase in capex to ~€300 million in 2014
Strong R&D platform

- Global R&D presence
- ~€150 million in catalysis R&D spend in 2013 (~7% of sales*)
- Focus on innovation, aligning regional capabilities to local market needs
- >1,100 catalyst experts globally
- Supported by >10,500 scientists in BASF Research Verbund

R&D sites

- De Meern, Netherlands
- Nienburg, Germany
- Beachwood, Ohio
- Pasadena, Texas
- Hannover, Germany
- Union & Iselin, New Jersey
- Huntsville, Alabama
- Tokyo, Japan (NE Chemcat)
- Seoul, Korea (Heesung)
- Shanghai, China
- Guilin, China
- Ludwigshafen & Heidelberg, Germany
- Amagasaki, Japan

* Excludes “Precious & Base Metal Services” and precious metals
Sales and profitability development by business

Underlying sales in € billion
w/o “Precious & Base Metal Services” and precious metals

Sales of “Precious & Base Metal Services” in € billion

EBITDA Indexed

EBITDA margin: ~2%

* 2012 figures restated, reflecting accounting changes due to IFRS 10/11
BASF's Catalysts division – driving above market growth

Catalysts sales
in € billion

Sales growth targets

- Achieve catalysts solutions sales of ~€2.8 billion by 2015
- Deliver sales growth above global catalysts market through 2015
- BASF's strategic relevant catalysts market expected to grow at ~6% p.a. between 2010 and 2015

Prior to IFRS restatement ~3.0

Sales growth targets

- Achieve catalysts solutions sales of ~€2.8 billion by 2015
- Deliver sales growth above global catalysts market through 2015
- BASF's strategic relevant catalysts market expected to grow at ~6% p.a. between 2010 and 2015

* Previously €3.0 billion; adjustment reflects restatement of €0.2 billion related to IFRS changes
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Growth drivers for Mobile Emissions Catalysts

- **Global tightening of environmental regulations**
  - in established and emerging markets
  - driving heavy-duty diesel market CAGR of 21% through 2015

- **Accelerated shift of vehicle manufacturing to BRIC countries**
  - Chinese automotive sales projected to deliver 11% CAGR through 2015

- **Tightening fuel economy, CO₂ regulations**

- **Ongoing powertrain changes**
  - Requires continuous development of new catalytic solutions
Emissions catalysts market – regulation remains primary demand driver

Announced Regulations

Future Regulations

USA
- US 2010
- Global, 4a
- US 10
- Global, 4b
- Euro 5
- Global, 4a
- CA LEV III
- Euro VI
- Phase In
- Global, 4b
- Euro 6b
- Phase In
- Global 5
- Euro 6c
- Global 5
- Euro 7
- Euro VI

Europe
- Global, 4a
- Euro VI
- Global, 4b
- Phase In
- Euro 6b
- Phase In
- Euro 6c
- Global 5
- Euro 7
- Euro VI

Brazil
- Euro V
- Euro 5
- Euro 5
- Euro 5
- Euro 4
- Euro 6
- Euro 6
- Euro VI

Russia
- Euro 4
- Euro IV
- Euro 5
- Euro V
- Euro 4
- Euro 6
- Euro 6
- Euro VI

India
- Euro 4
- Euro IV
- Euro 3
- Euro 5
- Euro 4
- Euro 5
- Euro VI

China
- Euro 4
- Euro IV
- Euro 4
- Euro 5
- Euro 4
- Euro 5
- Euro VI

South Korea
- Euro V
- Euro 5
- Global 3
- Euro VI
- Global 4

Japan
- Global, 4a
- Global, 4b
- Post 2009
- Euro 4

Vietnam
- Euro 4
- Euro 4
- Euro 5

Thailand
- Euro 4
- Euro 5

Legend:
- Light Duty
- Heavy Duty
- Motorcycle

Years:
BASF – leading mobile emissions catalysts provider

Mobile Emissions Catalysts SRM* in € billion

- Light-duty: ~4.2 billion, 7% p.a.
- Heavy-duty diesel: 21% p.a.

CAGR 2012-2015: 11%

* Strategic relevant market excluding precious metal
What makes BASF the Mobile Emissions Catalysts market leader?

# 1 in Light-duty

# 2 in Heavy-duty diesel

# 2 in Motorcycles

Key factors:

- **Technology leadership** – matching innovation focus with regulation maturity
- **Proximity to the customer** – local manufacturing, technical services and R&D presence in both established and emerging regions around the globe
- **Focus on high growth market** – heavy-duty diesel vehicles
- **Leveraging BASF’s inroads** – excellent customer relations in global automotive markets
### Bringing great products to market
Provider of choice for innovative technology solutions

<table>
<thead>
<tr>
<th><strong>Four-Way Conversion Catalyst (FWC™)</strong></th>
<th><strong>Lean NOx Trap + Multifunctional Catalyzed Soot Filter (LNT+CS4F™)</strong></th>
<th><strong>Selective Catalytic Reduction on filter (SCRoF™)</strong></th>
</tr>
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<tbody>
<tr>
<td>- Single component, removes particulate matter, carbon monoxide, hydrocarbons and nitrogen oxides from gasoline-engine exhaust</td>
<td>- Removes particulate matter, carbon monoxide, hydrocarbons and nitrogen oxides from diesel-engine exhaust with fewer components</td>
<td>- Controls nitrogen oxides and particulate matter</td>
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<tr>
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<td>- Superior durability; maintains performance while saving systems space and weight</td>
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The most powerful patent portfolio in the sector
Technology leadership
Innovation leader in environmental technology

Global emissions catalysts patents (2009 – 2013)

Number of patents

Graph showing the number of patents for BASF and competitors from 2009 to 2013.
Proximity to the customer
Leveraging local presence and capabilities in China

- BASF is a market leader in China
- >30 million catalysts manufactured at integrated Shanghai emissions catalysts and R&D hub since 2005
- ~€60 million invested in Shanghai-based operations to date, with additional investments to follow
- Project to double production capacity in Shanghai to be completed in 2014
- Estimated annual production of 33 million passenger cars in China by 2020
Proximity to the customer
Expansions in high-growth mobile emissions catalysts regions

Brazil growing at 7% CAGR 2012 – 15
- #2 catalysts supplier
- Ongoing capacity expansions at Indaiatuba, Brazil, production site (2010-2013)

India growing at 13% CAGR
- #1 catalysts supplier
- Manufacturing capacity expansion at Chennai, India, production site (2009, 2011)
- New Chennai production site being built to address growing demand (2014-15)

- ~€35 million in capacity expansions since 2006
- > €80 million incremental investment planned through 2016
Proximity to the customer
New plant in Poland to meet growth from Euro 6 & Euro VI

Market growth and regulation support establishment of new production hub in Środa Śląska

- BASF’s largest emissions catalysts manufacturing facility globally
- More than doubles regional production capacity in Europe
- Phase 1 production launched Q1 2014; full project completion in 2016
- Excellent access to German and East European customers (canners) & substrate suppliers
- Investment of ~€ 90 million initially, ramping up to €150 million by 2016
Focus on high-growth market
Heavy-duty diesel vehicles

BASF’s current technologies and business

- Leading edge technologies for new on-road and off-road regulations
- Cost effective state-of-the-art technologies for emerging markets
- On-road market: significant new business already awarded to BASF
- Off-road market: Gold Certification status at Caterpillar – the #1 player in off-road

Targets

- Increase market share in on-road market
- Secure leading share with top customers in emerging off-road market (largest opportunity in China, not currently regulated)
Leveraging BASF’s inroads
Excellent customer relations with all major OEMs

BASF is competitively advantaged across the automotive value chain

- Addresses all major global and local OEMs
- Market approach coordinated by a “Global Automotive Steering Committee”
- Provides integrated, leading-edge solutions
- Brings greater value and technology to market faster

Adding value as one company
1 | BASF a market leader in catalysts

2 | Strategy for growth in core business units

3 | Emerging opportunity in Battery Materials
Growth drivers for Chemical Catalysts

- **Technology**
  - Demand for better process economics
  - New chemical processes or routes

- **Raw material change for chemical production**
  - Increasing use of natural gas, coal and biomass as alternative feedstocks
  - Heavier crude oil feedstocks

- **Global economic expansion**
  - Chemical growth in Asia and Middle East
  - Increasing energy demand
  - Strong growth in polyolefin consumption

- **Regulations**
  - Legislative requirements drive demand for new environmental solutions in US and EU
BASF – global leader with solutions along the chemical value chain

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2015</th>
<th>CAGR 2012-2015</th>
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<tbody>
<tr>
<td>Chemical catalysts</td>
<td>~4.7</td>
<td>~5.6</td>
<td>6%</td>
</tr>
<tr>
<td>Polyolefins</td>
<td></td>
<td></td>
<td>5% p.a.</td>
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<tr>
<td>Adsorbents</td>
<td></td>
<td></td>
<td>3% p.a.</td>
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<tr>
<td>Chemical catalysts</td>
<td></td>
<td></td>
<td>7% p.a.</td>
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Chemical Catalysts SRM* in € billion

* Strategic relevant market
What makes BASF the Chemical Catalysts market leader?

Key factors:

- **BASF innovation network** – catalytic process innovator and chemical industry benchmark
- **Strong technology position** – most comprehensive product & technology portfolio serving large variety of high-growth applications
- **Technical expertise** – broad know-how of catalysts and processes
- **Strategic partnering** – strong relations with process licensors and innovative customers
- **Market position** – excellent position in major growth markets and segments
Strong technology position and reach
Broadest product portfolio

- **Regional expansion** – Targeted growth in Asia; planned new manufacturing hub in Shanghai (2016)
- **Operational excellence** – Continuous process efficiency & productivity-driven cost reductions
- **Expansion in high growth markets** – including zeolites, base metal catalysts
- **Value creating acquisitions** – CRI styrene catalysts (2012)
- **Product Innovation** – continuous R&D expenditure (~ 5% of sales) for new and improved products

R&D pipeline and targeted investments will further improve BASF’s leading technology position in Chemical Catalysts
Bringing great products to market
R&D expertise provides sustainable competitive advantages

- **Climate gas catalyst**
  - BASF technology eliminates nitrous oxide emissions up to 100%

- **Emission control zeolites**
  - BASF zeolite technology enables high-quality diesel NOx abatement catalysts, allowing cost-effective regulatory compliance

- **Bio-renewables**
  - Ethylene from ethanol catalyst for downstream renewables (green glycol)
  - Process & catalyst for producing bio propylene glycol (PG) from glycerin
Strategic partnering
Strong relations with process licensors and innovative customers

- Innovative technologies to produce olefins and alcohols
- Adding value to coal-based value chains in China

- BASF catalysts support Sasol’s ability to convert gas into low-sulfur diesel, naphtha and LPG

- Tailored manufacturing, supply and technical service relationships with mix of industry leaders

~ 25% of R&D funding supports long-term partnership projects
1 | BASF a market leader in catalysts

2 | Strategy for growth in core business units

3 | Emerging opportunity in Battery Materials
Growth drivers for Refinery Catalysts

- **Continuing shift in refined product mix**
  - Drives high growth in petro and diesel fluid catalytic cracking (FCC) catalysts

- **Access to tight oil delivering new challenges and opportunities**
  - Short-term focus in North America, mid- to long-term in other regions

- **Declining feedstock quality globally**

- **Tightening environmental and fuel quality regulations**

- **Increasing global fuel demand**
  - Accelerated growth in Middle East through 2016 and Asia continuing beyond 2025
BASF is #2 globally in FCC catalysts and additives

FCC Refinery Catalysts market*
in € billion

Key success factors

- A global leader in FCC catalysts
- Leading-edge refining solutions
- Superior performance in Gas Oil catalysts
- Proprietary Distributed Matrix Structure (DMS) technology
- Strong technical sales force
- Reliable supply with short lead times
- Strong innovation pipeline

* FCC is one component of the SRM – BASF is not currently present in hydroprocessing technology
Technical expertise
R&D expertise provides sustainable competitive advantages

Low Rare Earth Phinesse™ Catalyst
- Vacuum Gas Oil FCC catalysts with raw material flexibility
- Provides equivalent yields to market leading BASF NaphthaMax® III with 50% less Rare Earth

Flexible Innovation: AEGIS™ Catalyst
- Resid market solution, allows refiners to adjust zeolite-to-matrix (Z/M) ratio to calibrate yield selectivity
- Provides exceptional metals tolerance and bottoms-upgrading capability
1 | BASF a market leader in catalysts

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Market leader in precious metals (PM) management and sourcing services

Total sales 2013 in € billion

- Mobile Emissions Catalysts: 2.3
- Chemical Catalysts: 0.6
- Refinery Catalysts: 0.3
- Precious and Base Metal Services: 2.4

€5.7* billion

- **PM distribution** – Supply chain management, risk management for BASF and key customers
- **PM processing** – Refining and recovery services, including auto catalysts recycling
- **Financial expertise** – Trading and hedging of Platinum Group Metals (PGMs)
- **Manufacturing** – Precious metals salts and solutions for industrial applications driven by technology

“Full loop” portfolio leveraging robust capabilities in trading, refining, manufacturing & catalysis

* Including €0.1 billion in other sales
Leveraging precious metals market insight

Supply Insight
Direct visibility into platinum group metals (PGM) market supply
- Mine supply
- Secondary supply
- Trading flows
- PGM supply chain finance / management

Future Insight
Unparalleled market insight into evolving R&D trends

Demand Insight
Direct visibility into PGM market demand
- Automotive demand
- Chemical demand
- Investor demand
- LPPM Fixing trading flows

Supply / Demand Forecast

24-Hour Global Trading Team

- Enable industrial business
- Trading & hedging expertise
- Price risk management
- Strategic positioning
- Access to multiple liquidity pools
BASF provides 24/7 access to PGM market liquidity
Focus on high-growth and sustainable metals recycling market

Targets
- spent automotive recycling
- #1 global catalyst recycler
- First mover in China

Key Success Factors
- High metal velocity – Faster settlement times
- Expertise in assay analysis – Fast, accurate, and transparent assay results
- Integrated trading platform – Financial services including price risk management
- Global footprint – Commercial collection points in all regions
- Innovation – New BASF technology to optimize metals recovery yields
1 | BASF a market leader in catalysts
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Battery technologies are key enabler for growing electric vehicle market

- Future of electromobility depends on batteries with higher energy density, greater power, lower cost
- Innovative solutions from the chemical industry will drive battery market growth
- Battery materials such as cathodes and electrolytes are vital to performance, cost and safety of batteries

Total global battery market potential: >€20 billion by 2020
Enabling technology: Battery Materials
Driving the future of electromobility

Business potential 2020
- Strategic relevant market: >€5 billion globally (~€4 billion in Asia Pacific)
- Sales potential BASF: >€500 million globally (~€350 million in Asia Pacific)

BASF activities
- Start of business unit “Battery Materials” in 2012
- Several technology-driven acquisitions undertaken
- Three-digit million euro invest for R&D and production
- R&D network with universities / industrial partners

BASF’s technology roadmap - Battery materials for today and tomorrow

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<td>Li-ion</td>
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<td></td>
<td></td>
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<tr>
<td>HE/HV</td>
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<td></td>
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<tr>
<td>Li-ion</td>
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<td>Li-S</td>
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Driving range (km)*

- From Li-ion to Lithium-sulfur

* Driving range (km) of an electric car (with a 100kg battery)
BASF’s battery materials portfolio
Comprehensive today, further strengthened

Lithium ion technology

Electrolytes
(production; R&D)

Cathode active materials
(production; R&D)
- Nickel Cobalt Manganese NCM
- Lithium Iron Phosphate LFP

Anode active materials
(R&D)

NiMH technology License business, NiMH battery materials

LiS technology Investment of $50 million in Sion Power (R&D)

BASF/Toda Kogyo In negotiations to establish JV in Japan

BASF has a broad battery materials portfolio today, and continues to invest
BASF: Global footprint today, further expansions in near future

Largest NCM production plant of the US (2.4 kt): Elyria

Production capacity: Suzhou, China
Further capacity: Louisiana, US

Production

Sales Office

Application labs, research centers

Further application labs: US, China, Germany
Research centers: US, Germany

Electrolyte production

R&D/Application Technology Center
Battery demand e-mobility market in GWh (Lithium-ion batteries)

- Total e-mobility market* will increase more than fivefold from 2012 to 2015
- Electrified (LiB) passenger car sales in 2013: ~400,000 units
- Launches of new electrified vehicles announced by major OEMs (including Daimler, BMW, Volkswagen) will drive battery demand
- Forecast for electrified passenger cars sold in 2015: >1 million units**

* The e-mobility market includes EVs, PHEVs, Hybrids, buses, e-cycles and commercial vehicles.

** Source: Bloomberg and BASF estimates

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BASF’s Catalysts Division targets 2015

Key operational and financial targets

- Extend our position as the global leader in catalysis and establish leadership position in battery materials market

- Continue to grow profitably above global catalysts market rates

- Achieve total Catalysts division sales, excluding metals*, of ~€2.8 billion** by 2015 with increased profitability

- Solidify our leadership position in technology