LANXESS Capital Markets Day 2012
Performance Butadiene Rubbers –
The key enabler of “Green Tires”

Joachim Grub
Head of Business Unit Performance Butadiene Rubbers
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Agenda

- PBR overview
  - “Green Mobility” drives demand for high-performance rubbers
  - Update on market landscape
  - PBR – Excellent partner for the tire industry

“Green Mobility” energized by LANXESS

Chemistry is the key to “Green Mobility”

Performance Polymers: ~60% of group sales; ~60% of segment earnings

- Butyl Rubber
- Performance Butadiene Rubbers
- Technical Rubber Products
- High Performance Materials
PBR overview – Top solutions meeting future mobility needs

**Key figures:**
- Sales: >€500 m
- Capacity: >900kt/a
- Employees: >1,000
- Customers: >250

**Product groups:**
- Polybutadiene rubber (PBR)
- Styrene-butadiene rubber (S-SBR and E-SBR)

**Main competitors**
- NKNK
- Versalis
- JSR
- Synthos
- Sibur
- Asahi Kasei
- Trinseo

**Sales by end use**
- [BU sales]
  - Technical rubber: 10%
  - Plastics: 11%
  - Lifestyle & leisure: 7%
  - Tire & retread: 72%

**Market**
- Global nameplate capacity: ~10,600kt²
- LANXESS #1 supplier of high-performance rubbers³

**Main competitors**
- S-SBR and PBR
- E-SBR
- NKNK⁴
- Versalis⁵
- JSR
- Synthos
- Sibur
- Asahi Kasei
- Trinseo⁵

**Sales by end use**

- Tire & retread: 72%
- Technical rubber: 10%
- Lifestyle & leisure: 7%
- Plastics: 11%

**Market development**
- Global demand growth (CAGR 2012-2017)² for PBR and E-SBR
  - Asia-Pacific: ~7%
  - EMEA: ~2%
  - North America: ~2%
  - Latin America: ~6%

**Main growth drivers**
- Growing mobility needs
- Asian middle class
- Start of replacement cycle
- Reduction of CO₂
- Increasing legislation
- Proliferation of performance
- Increase of fuel efficiency
- Growing retread potential

**Regional demand split 2012e**
- [kt units]
  - Asia-Pacific: 54%
  - North America: 18%
  - EMEA: 22%
  - Latin America: 6%

**Market development**
- Global demand growth (CAGR 2012-2017)² for S-SBR and Nd-PBR
  - ~10%

**Main growth drivers**
- Growing mobility needs
- Asian middle class
- Start of replacement cycle
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- Increase of fuel efficiency
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² Source: IHS Chemicals 2012.
³ High-performance rubbers include rubbers such as S-SBR and Nd-PBR.
⁴ Nizhnekamskneftekhim; Versalis formerly Polimeri; Trinseo formerly Styron.
⁵ LANXESS estimates based on IHS Chemicals 2012

[BU sales]

* LANXESS estimates based on IHS Chemicals 2012
PBR offers different types of synthetic rubber for better tire performance

<table>
<thead>
<tr>
<th>Products</th>
<th>Characteristics</th>
<th>Tire industry applications</th>
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</table>
| Nd-PBR   | • Outstanding abrasion resistance  
              • Reduced rolling resistance  
              • Excellent strength  
              • High crack resistance | • Nd-PBR with high molecular weights and low polydispersities |
| S-SBR    | • Excellent wet grip  
              • Reduced rolling resistance  
              • Good abrasion characteristics  
              • Superb mechanical properties | • Tread |

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- PBR overview
- “Green Mobility” drives demand for high-performance rubbers
- Update on market landscape
- PBR – Excellent partner for the tire industry
High-performance rubbers help to achieve the global CO$_2$ emission reduction goals

- CO$_2$ reduction is a global goal
- Legislators have already issued related regulation and emission cutting targets
- Tire labeling increases transparency of the tire performance and pushes demand for “Green Tires” and hence reduces CO$_2$ emissions
- “Green Tires” have to fulfill certain criteria such as rolling resistance and wet grip, only achievable with high-performance rubbers

Traffic-related CO$_2$ emissions ~20%
thereof tire related ~25%

Tires play a key role in CO$_2$ reduction


“Green Tires” have a large impact on CO$_2$ reduction

- Reduced rolling resistance*: -30%
- Reduced fuel consumption: -0.5l/100km
- Reduced CO$_2$ emissions: ~1.2kg/100km

Logic chain of “Green Tires”

Improved environmental impact

Source: www.auto-motor-und-sport.de/eco/verbrauchsermuesigung-rolldenstandsoptimierte-reifen-alle-aber-den-rolldenstand-1899988.html (Calculation based on a car with a gasoline engine and an average fuel consumption of 10l/100km); * Reduced rolling resistance versus standard tires
PBR targets the reduction of the environmental footprint of “Green Tires” in two main dimensions

- State-of-the-art production processes
- Optimized energy consumption
- Sustainable usage of raw materials, e.g. investigate renewable resources and solely use of low PAH\(^*\) containing processing oils

High-performance rubbers provide solutions to the tire industry

- Improve balance between rolling resistance and wet grip behavior
- Increase durability to extend the tire life span
- Extend tire lifecycle by retreading
- Optimize processability of rubber

\(^*\) PAH: Polycyclic aromatic hydrocarbons

Increased fuel efficiency was propelled by tire design first and now benefits from tire materials

High-performance rubbers define new era

- In the post war era huge capacities for rubber and tires were built
- After the oil crisis, the radialization succeeded in the western world, providing a new standard of safety and performance built on design
- The new era will clearly be defined by the performance leap based on high-performance rubbers

Source: US Department of Labor; \(^*\) Producer Price Index – Tires, 1939-2011

Dominant factors in tire market

- Oil / energy crisis
- Growing S/D gap in China

Source: US Department of Labor; \(^*\) Producer Price Index – Tires, 1939-2011
Tire labeling increases pressure to reduce CO₂ emissions and will create transparency for the customer.

**Illustrative**

<table>
<thead>
<tr>
<th>Rolling resistance coefficient (the lower the better → fuel savings)</th>
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<tbody>
<tr>
<td><strong>Path of improvement</strong></td>
</tr>
<tr>
<td>Current performance distribution</td>
</tr>
<tr>
<td>E-SBR + PBR + Carbon Black</td>
</tr>
<tr>
<td>S-SBR + PBR + Carbon Black</td>
</tr>
<tr>
<td>S-SBR + PBR + Silica</td>
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</tbody>
</table>

**20-30% of fuel consumption are attributable to tires**

**High-performance rubbers help to save a considerable part**

**Introduction of “Green Tires” in the early 90ties reduced rolling resistance by 20%**

**Further considerable savings are possible – with high-performance rubbers already on the market**

Cutting-edge tires help save energy

* PBR: General Purpose Butadiene Rubber; ** fct.: Functionalized S-SBR for better integration of the filler into the polymer matrix

Market aspirations of tire manufacturers can only be met with high-performance rubbers

- 1st and 2nd tier manufacturers aim for higher than B/B labels to meet market expectations
- Big gap between targeted and maximum achievable labels with non-functionalized S-SBR
- E-SBR and Carbon Black compounds forecast to loose significance due to low labeling performance

**Top labels require high-performance rubbers**

Performance of different rubbers in EU labeling scheme*

- Target labels with Nd-PBR and S-SBR fct.
- Max. labels with S-SBR
- Max. labels with E-SBR / CB**

Wet grip

* Statements are applicable to passenger car tires only; ** Carbon Black

Source: LANXESS market study “S-SBR Global Market Study”
Acceptance of “Green Tires” benefits from Nd-PBR increasing durability and fuel efficiency without compromising on safety

- S-SBR has excellent leverage on tire performance
  - Improved wet grip behavior
  - Reduced rolling resistance
  - But, comparably high abrasion
- Nd-PBR combines superior abrasion with low rolling resistance characteristics

High-performance rubbers extend the magic triangle

Proliferation of labeling initiatives supports a global homogenization of tires

- Japan, Korea and Europe are leading the way with labeling initiatives already in place
- Pending regulation in the USA, but concept already detailed
- China is making reference to a labeling concept in the current 5-year-plan
- Brazil, India and Russia are expected to follow with an initiative soon

Labeling promotes “Green Tires”
Retreading increases demand for high-performance rubbers in the future

Good cause for retreading
- Radialization is a pre-requisite and proliferating
- Retreading consumes less resources and is more economical (~25% of costs of a new tire, but 100% PBR)
- Growing car fleets will trigger higher demand for retreading
- Tire manufacturers build new retreading business models
- Retreads account for 31% globally*

Retreading consumes far less resources
- Quality test and inspection of used tire
- Removal of old tread and buffing of carcass
- Application of new tread and curing
- Intensive final inspection and finish


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Supply / demand forecast to tighten mid-term; trend to high performance continues

Source: LANXESS estimates based on IHS Chemicals 2012

LANXESS strives for high-perform. grades

LANXESS expands into future growth regions

Source: IHS Chemicals 2012
LANXESS – Global #1 for Nd-PBR with unique production network

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LANXESS is a very competent global partner for the tire manufacturing industry due to its unique set of offering.

**Unique set of offering**

**Products**
- Broad portfolio
- High-performance rubbers
- High-quality grades
- Globally available products

**Know-how**
- R&D
- Technical service
- Understanding of the 360° of rubber

**LANXESS – Enabler of “Green Mobility”**

PBR will continue to serve customers’ growth

**Production expansion in all regions**

- **High-performance rubbers**
  - Dormagen: +15kt Nd-PBR Expansion
  - Cabo: +20kt Nd-PBR Expansion
  - Orange: +15kt Nd-PBR/S-SBR Expansion
  - Singapore: +140kt Nd-PBR Expansion

- **E-SBR**
  - Singapore: +1,000kt E-SBR

<table>
<thead>
<tr>
<th>Year</th>
<th>Debottlenecking / retrofitting</th>
<th>Greenfield</th>
<th>2015e</th>
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<tr>
<td>2010</td>
<td></td>
<td>Greenfield</td>
<td>2015e</td>
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New Nd-PBR facility strengthens PBR’s global production network

- PBR – Outstanding global footprint with world-class manufacturing base
- Serving current and future requirements of performance-oriented customers
- Emerging markets shift towards performance applications – LANXESS has strong footing in BRICS

PBR has long-standing supplier relations and secures access to butadiene

- Global supply footprint
- Partly captive sourcing
- Primarily pipeline supply
- Excellent structural access
- World’s largest merchant butadiene buyer

LANXESS has excellent sourcing position

- Technology is available
- USA used to be supplied by on purpose plants historically
- Economics for on purpose butadiene depend on butadiene selling price and energy cost

On purpose butadiene technology could ease S/D balance

- Re-dedication of butadiene towards higher-performance products

High-performance rubbers create value that ensures access to butadiene
Performance Butadiene Rubbers – Enabling “Green Mobility”

- Megatrends generate underlying growth
- Materials to determine top tire performance

- PBR enables quality growth in all regions
- Raw materials are a regional matter, but centrally managed

- PBR provides superior added value to customers
- Outstanding rubber expertise

LANXESS premieres AA-rated concept tire

Film at conference