TRP – Leading supplier of specialty elastomers for automotive applications

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LANXESS Business Unit Technical Rubber Products

Automotive Days Poland
October 27-28, 2011
Agenda

- Global rubber market and LANXESS’ rubber portfolio
- TRP overview by product lines
- TRP in automotive applications
- Conclusions
Global rubber market was ~21 mn mt in 2009

- 11.8 mn mt synthetic rubber
- 9.4 mn mt natural rubber

Sources: International Rubber Study Group; company estimates based on IRSG, CEH and IISRP
LANXESS offers the broadest portfolio of synthetic rubbers for the automotive industry

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Tire</th>
<th>Technical rubber products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SBR</td>
<td>BR</td>
</tr>
<tr>
<td>LANXESS</td>
<td>✔</td>
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<tr>
<td>POLYMER EUROPA</td>
<td>✔</td>
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<tr>
<td>DUPONT</td>
<td>✔</td>
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<tr>
<td>DOW</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>EXON</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>JSR</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>EDION CHROMATEC LTD</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Please note: per May 1, 2011 also including KELTAN® EPDM
→ TRP thus being # 1 in global EPDM-market
We at TRP are thus focused on non-tire applications…

Some applications

- Functional, safety and performance parts for automotive (belts, hoses, wiper blades, weather strips, seals)
- Mechanical engineering (hoses, tubes, cables, gaskets, membranes, roll covers)
- Leisure industry (sponges, shoe soles)
- Building materials (membranes, seals, FRNC cables)
...providing a portfolio of special purpose and specialty products with well known brand names

Product Portfolio

- **Rubber specialties:** FKM, EVM, HNBR, NBR
  - Levapren®
  - Levamelt®
  - Nanoprene®
  - Keltan®
  - Buna® EP

- **Special purpose rubber:** CR, EPDM, NBR
  - Levatherm® F
  - Therban®
  - Baymod® N
  - Baypren®
  - Kryvac®
  - Perbunan®

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ASTM classification – Temperature versus oil swell

Temperature resistance (ºC)

Oil swelling IRM 903 (vol.%)
Introduction CR (Baypren®) – Specialty rubber of chloroprene

CR properties and global demand

- Unique properties
  - Low permeability
  - Excellent fatigue resistance
- Further properties
  - Low-temperature flexibility
  - Adhesion to reinforcements
- Market volume:
  ~300-350 kt (2010)
- Average market increase:
  ~3-4% per year

Product:
25 kg CR-bags

Source: SRI 2009
Automotive sector represents ~25% of global CR consumption

CR global demand by industries and segments

- Polychloroprene is produced in a variety of grades in both dry and latex forms
- Dry grades of CR are normally used in industrial and automotive rubber goods such as axle boots, air springs, hoses and belts
- Latex grades of CR are used in waterborne adhesives and dipped goods, such as gloves and CVJ (Constant Velocity Joint) boots

Sources: SRI 2009, TRP internal; *Incl. all latex applications (et. al. adhesives)
Introduction NBR – Specialty rubber of acrylonitrile and butadiene

NBR properties and global demand

- Unique property
  - Oil resistance
- Average market increase: ~3% per year

Comparison of penetration time

<table>
<thead>
<tr>
<th>Penetration time [days]</th>
<th>Change of weight [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>14</td>
<td>150</td>
</tr>
<tr>
<td>21</td>
<td>200</td>
</tr>
</tbody>
</table>

Main product: NBR-bales

Krynac®: Flooring Shanghai airport
Perbunan®: Seals in pharma
Automotive end uses represent ~50% of total NBR consumption

NBR global demand by industries and segments

- NBR provides superior resistance to degradation by oil and fuels
- Automotive main segment, but also construction, food (e.g. milk inflation) and pharma (e.g. seals)
- LXS offers full range of NBR, also NBR specialties
  - Krynac®: extremely high oil resistance grades: 4450 / 4975
  - Krynac® X: for apron and cots
  - Perbunan® CHM: Clean High Modulus for injection molding
  - Baymod® N: for friction and plastic modification
- LANXESS’ worldwide biggest NBR site in France offers all NBR technologies to design NBR customer solutions

Source: TRP internal
Introduction EPDM (KELTAN®, Buna EP®) – The versatile elastomer

EPDM properties and global demand

- Unique property
  - Very good outdoor properties
- Further property
  - Easy processability
- Market volume:
  ~1,100 kt (2010)
- Average market increase:
  ~4-5% per year

Comparison of properties

Product:
25 kg bales, pellets
The EPDM market depends mostly on the automotive industry

EPDM global demand by industries and segments

- Consumption of EPDM in automotive applications is the major use for EP elastomers accounting for ~45-55% of global demand
- EP elastomers are used for various body and chassis parts, radiator and heater hoses, and door and window weatherstripping
- Thus, the growth of EP elastomers depends heavily on the growth of the automotive industry as a whole

Sources: SRI 2009, TRP internal; *TPE/V also for automotive applications
From January 1, 2012, LANXESS will start having one brand name for all LANXESS high-performance rubber EPDM: KELTAN®

LANXESS will start having one KELTAN® EPDM portfolio and grade coding, streamlined but matching your requirements today and in the future; communication as of January 2012

LANXESS will convert its biggest production line in Geleen, The Netherlands, to innovative KELTAN® ACE technology by end of 2013
KELTAN® – LANXESS’ high-performance rubber (2/2)

- KELTAN® Eco will be the first EPDM based on ethylene from sugar cane
- Start of production: November 2011 at LANXESS site in Triunfo, Brazil
- Annual production capacity: 10,000 mt

KELTAN® Eco helps our customers produce "greener" products
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Elastomers in automotive – More than tires

Please note: applications serve as examples only and may not be used in its entirety in depicted model; *Elastomers portion only without fillers, content may vary depending on individual model
Typical automotive applications (1/2)

<table>
<thead>
<tr>
<th>EPDM</th>
<th>CR</th>
<th>NBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profiles, especially sponge</td>
<td>Wiper blades</td>
<td>Hoses</td>
</tr>
<tr>
<td>Plastics modification (TPV)</td>
<td>Hoses</td>
<td>Seals</td>
</tr>
<tr>
<td>Hoses</td>
<td>Belts</td>
<td>Plastics modification</td>
</tr>
<tr>
<td>Seals</td>
<td>Adhesives</td>
<td>Cables</td>
</tr>
<tr>
<td>Oil viscosity modifiers</td>
<td>Latex applications</td>
<td>Friction parts</td>
</tr>
<tr>
<td>Tires</td>
<td>Axel boots</td>
<td>Axel boots</td>
</tr>
</tbody>
</table>

- **EPDM**: Profiles, especially sponge, Plastics modification (TPV), Hoses, Seals, Oil viscosity modifiers, Tires
- **CR**: Wiper blades, Hoses, Belts, Adhesives, Latex applications, Axel boots
- **NBR**: Hoses, Seals, Plastics modification, Cables, Friction parts, Axel boots
Typical automotive applications (2/2)

<table>
<thead>
<tr>
<th>EVM</th>
<th>FKM</th>
<th>HNBR</th>
</tr>
</thead>
</table>
| - Fuel hose covers  
  - Rocker box cover seals  
  - ABS covers  
| - Oil rings  
  - Shaft seals  
  - Valve stem seals  
| - Transmission belts  
  - Dampeners / isolators  
  - Seals  
  - Hoses  

![EVM Image](image1)

![FKM Image](image2)

![HNBR Image](image3)
CR (Baypren®) – Typical applications

- Best resistance to dynamic crack formation, very good low temperature flexibility
  - => Baypren® 126

- Higher tear resistance at elevated temperatures, higher tensile strength
  - => Baypren® 216

- Extrusion: smooth surfaces / sharp edges / low die swell; time savings mixing; no staining
  - => Baypren® 114
Solid and sponge sealing systems
(60-65% of automotive volume)

Wipers and belts (5% of automotive volume)

Hoses (10% of automotive volume)

Source: Company estimates
EPDM – Typical automotive applications (2/4)

Buna EP® G 8950 / KELTAN® 4903 / 6251A

Sponge profiles
EPDM – Typical automotive applications (3/4)

Buna EP® G 6470 / KELTAN® 5508

Window / body sealing profiles

Keltan® X Buna® EP
EPDM – Typical automotive applications (4/4)

Coolant hoses
NBR – Important automotive applications, NBR powder in friction – Examples

**Baymod® N in automotive safety parts – Brakes**

- Preferred material Baymod® NXL 3843
- Key requirements product
  - Flexibility
  - Compactness
  - Friction coefficient
  - Noise
  - Heat resistance
- Key requirements process
  - Powder material preferred
  - Dry mixing and sintering process
Important automotive applications of NBR / HNBR seals – Examples (incl. oil filter and shock absorber seals)

**Typical grades**
- Krynac® 4450
- Perbunan® 3945
- Therban® 4307 and 8505
Important automotive applications of NBR / HNBR hoses – Examples

Typical grades
- Perbunan® 1846 (brake)
- Perbunan® 2845 (hydraulic / fluid hoses)
- Therban® 3406 (hydraulic / power steering)
Important automotive applications of NBR / HNBR hoses – Examples; friction – Examples

**Key requirements**

- **Product**
  - Flexibility
  - Compactness
  - Friction coefficient
  - Noise
  - Heat resistance

- **Process**
  - Powder material preferred
  - Dry mixing and sintering process

**Typical grades**

- Therban® 4407
- Perbunan® 2845

**Typical grade**

- Baymod® N XL 3843

**Brake pads**
HNBR – Typical automotive applications (1/2)

Transmission belts
HNBR – Typical automotive applications (2/2)

Dampers / isolaters
LANXESS Technical Rubber Products
EVM – Typical applications

Rocker box cover seal

ABS cable

Fuel hose cover
FKM – Typical automotive applications (1/3)

O-rings
 Shaft seals
Valve stem seals
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<table>
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<tr>
<th>LANXESS Technical Rubber Products – Summary</th>
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<tr>
<td><strong>KELTAN® / Buna EP®</strong></td>
</tr>
<tr>
<td>▪ The versatile outdoor elastomer</td>
</tr>
<tr>
<td>▪ Needed in fuel and in heat areas</td>
</tr>
<tr>
<td><strong>Levatherm® F</strong></td>
</tr>
<tr>
<td>▪ The “fire fighter”</td>
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<tr>
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</tr>
<tr>
<td><strong>Baypren®</strong></td>
</tr>
<tr>
<td>▪ The all-rounder</td>
</tr>
<tr>
<td><strong>Perbunan® / Krynac® / Baymod® N</strong></td>
</tr>
<tr>
<td>▪ In oily conditions</td>
</tr>
<tr>
<td><strong>Krynac® X</strong></td>
</tr>
<tr>
<td>▪ Where grip and low abrasion is required</td>
</tr>
<tr>
<td><strong>Therban®</strong></td>
</tr>
<tr>
<td>▪ Best mechanical properties in hot abrasive oily cases</td>
</tr>
</tbody>
</table>
Conclusions: LANXESS as your partner of choice

- LANXESS TRP is very committed to grow and build its specialty synthetic rubber products for non-tire applications with certainly a strong focus on automotive applications
  - Acquisition of KELTAN®, EPDM, KELTAN® Eco, investments in ACE technology
  - Debottlenecking of CR, HNBR and EVM capacity, becoming effective during H2 2012
  - Start-up of JV with local production of NBR in China, effective H2 2012

LANXESS has a great portfolio of elastomers fit for use in automotive applications and we would like to be the supplier and development partner of choice for you
Disclaimer

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http://www.mandatory-information.gmbh.lanxess.com

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