WRM – “All-in-one” Repair Kit
Urethane Systems

June 2020
Agenda

1. About LANXESS
2. Urethane Systems – Materials and applications
3. Urethane Systems – Expertise in mining
4. WRM product – Our solution for mining repairs
5. WRM product – Application guidance
6. WRM product – A large range of applications
LANXESS –
A globally operating specialty chemicals company

Specialty chemicals company
- Spin-off from Bayer in 2004
- Specialty chemicals portfolio: chemical intermediates, additives, specialty chemicals and plastics

Global success story
- Approximately 14,300 employees in 33 countries
- Global sales of EUR 6.8 billion in 2019

Strategy of profitability and resilience
- Strengthening of leading position in medium-sized markets
- Consolidation in Europe, expansion in USA and Asia
Our path towards the ‘new’ LANXESS

Milestones of transformation

- Foundation of ARLANXEO
- Clean & Disinfect (C&D) acquisition
- Chemtura acquisition
- Phosphorus Chemicals (PC) acquisition
- Sale of ARLANXEO to Saudi Aramco
- IPEL acquisition
- Sale of chrome chemicals business
LANXESS – a global specialty chemicals group

<table>
<thead>
<tr>
<th>Advanced Intermediates</th>
<th>Specialty Additives</th>
<th>Consumer Protection</th>
<th>Engineering Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Industrial Intermediates</td>
<td>Lubricant Additives Business</td>
<td>Liquid Purification Technologies</td>
<td>High Performance Materials</td>
</tr>
<tr>
<td>Inorganic Pigments</td>
<td>Polymer Additives</td>
<td>Material Protection Products</td>
<td>Urethane Systems</td>
</tr>
<tr>
<td></td>
<td>Rhein Chemie</td>
<td>Saltigo</td>
<td></td>
</tr>
</tbody>
</table>

Group Functions and countries

Business unit set up fosters dedication and entrepreneurship
LANXESS well diversified

LANXESS group – Sales by industry sector*

- Automotive
- Construction and electrical/electronics
- Agrochemicals
- Chemicals
- Others

Sales by region*

- Asia-Pacific
- Latin America
- North America
- Germany
- EMEA (excluding Germany)

* Numbers as of 2019
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Urethane Systems benefits from a global footprint, technology leadership and a broad customer base

<table>
<thead>
<tr>
<th>Technology leader in Low Free (LF) isocyanate technology</th>
<th>&gt;60 years of experience in urethane chemistry</th>
<th>A leading supplier of cast urethane systems globally</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 production plants globally</td>
<td>7 application development centers globally</td>
<td>1 world-class R&amp;D center in the USA</td>
</tr>
<tr>
<td>&gt;500 products to serve customers’ needs</td>
<td>&gt;250 m€ sales in 62 countries</td>
<td>~400 employees globally</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LANXESS Urethane Systems
Global coverage for its customers

- Cologne, GER
- Nantong, CHN
- Gastonia (NC), US
- Perth Amboy (NJ), US
- Naugatuck (CT), US
- Latina, IT
- Baxenden, UK
- Mumbai, IND
- Porto Feliz, BRA
- Sydney, AUS

Headquarter
Plant
R&D Center
Application & Development Center
### Four product groups provide high-quality solutions for a wide range of applications

<table>
<thead>
<tr>
<th>Products</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomers</td>
<td>Oil &amp; Gas</td>
</tr>
<tr>
<td></td>
<td>Mining</td>
</tr>
<tr>
<td></td>
<td>Wheels &amp; Tires</td>
</tr>
<tr>
<td></td>
<td>Paper &amp; Printing</td>
</tr>
<tr>
<td></td>
<td>Industrial</td>
</tr>
<tr>
<td>Coatings</td>
<td>Leather &amp; Textile</td>
</tr>
<tr>
<td></td>
<td>Glass fiber sizing</td>
</tr>
<tr>
<td></td>
<td>Breathable coatings</td>
</tr>
<tr>
<td></td>
<td>Automotive coatings</td>
</tr>
<tr>
<td></td>
<td>Protective coatings</td>
</tr>
<tr>
<td>Adhesives &amp; Sealants</td>
<td>Field applied ambient cured adhesives &amp; sealants</td>
</tr>
<tr>
<td></td>
<td>Factory applied heat cured adhesives &amp; sealants</td>
</tr>
<tr>
<td>Polyester Polyols</td>
<td>PU foam, TPU, and elastomer production</td>
</tr>
<tr>
<td></td>
<td>Adhesives for metals, paper and wood</td>
</tr>
<tr>
<td></td>
<td>Protective coatings</td>
</tr>
</tbody>
</table>

- Adiprene® LF
- Vibrathane®
- Adiprene®
- Vibraure®
- Duracure®
- Vibracat®
- Ultralast®
- Trixene®
- Witcoflex®
- Witcobond®
- Quasilan®
- Trixene®
- Witcobond®
- Adiprene® LF
- Fomrez®
- PU foam, TPU, and elastomer production
- Adhesives for metals, paper and wood
- Protective coatings
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WRM Product Line – The result of LANXESS’ deep expertise in the mining market
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4. **WRM product – Our solution for mining repairs**
5. WRM product – Application guidance
6. WRM product – A large range of applications
LANXESS offers a complete line of on-site repairing kits for high wear applications

“All-in-one” repair kit perfect for damaged mining equipment

- WRM repairing kit
  - WRM 80T
  - WRM Premium 80T
  - WRM Premium 65T
- WRM Primers
  - WRM Primer Metal
  - WRM Primer Urethane
  - WRM Primer Rubber
LANXESS WRM 80T *
A proven repair solution for more than 40 years

Kit available in **1kg and 4kg size**

Back to service in **24 hours**

**Excellent abrasion resistance** compared to harder brittle epoxy repair products

**Easy handling** for consistent high performance results

Suitable for **inclined or vertical surface**

<table>
<thead>
<tr>
<th>Properties</th>
<th>Standard</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
<td>ASTM D2240</td>
<td>80 Shore A</td>
</tr>
<tr>
<td>Working time (25°C)</td>
<td>—</td>
<td>30-40 min</td>
</tr>
<tr>
<td>Elongation at break</td>
<td>ASTM D412</td>
<td>540 %</td>
</tr>
<tr>
<td>Back to service Time</td>
<td>—</td>
<td>18 hrs</td>
</tr>
<tr>
<td>Tear Strength (Die C)</td>
<td>ASTM D624</td>
<td>63.0 kN/m</td>
</tr>
<tr>
<td>Tear Strength (Split)</td>
<td>ASTM D470</td>
<td>16.0 kN/m</td>
</tr>
<tr>
<td>Stress at Break</td>
<td>ASTM D412</td>
<td>13.0 MPa</td>
</tr>
<tr>
<td>Abrasion Loss</td>
<td>DIN 4649</td>
<td>117 mm³</td>
</tr>
<tr>
<td>Shrinkage (@30°C)</td>
<td>—</td>
<td>&lt;0.5%</td>
</tr>
</tbody>
</table>

**WRM 80T can be used on urethane, rubber, plastic or steel parts**

* Not available in REACH applicable countries
Newly launched WRM Premium
Improved performance and productivity

Great abrasion resistance
Perfect for the most challenging applications (hot & wet)
Better color retention

Quickly back to service for decreasing downtime

Safe to use
Improved EH&S conditions

Packaging enabling easy in-can mixing
Kit available in 0.75kg and 1.5kg size
Available in 2 hardesses

Suitable for inclined or vertical surface

WRM Premium can be used on urethane, rubber, plastic or steel parts

<table>
<thead>
<tr>
<th>Properties</th>
<th>Standard</th>
<th>WRM Premium 80T</th>
<th>WRM Premium 65T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
<td>ASTM D2240</td>
<td>80 Shore A</td>
<td>65 Shore A</td>
</tr>
<tr>
<td>Working time (25°C)</td>
<td>–</td>
<td>6-7 min</td>
<td>6-7 min</td>
</tr>
<tr>
<td>Elongation at break</td>
<td>ASTM D412</td>
<td>400 %</td>
<td>700 %</td>
</tr>
<tr>
<td>Back to service</td>
<td>–</td>
<td>2-4 hrs</td>
<td>2-4 hrs</td>
</tr>
<tr>
<td>Tear Strength (Die C)</td>
<td>ASTM D624</td>
<td>62.0 kN/m</td>
<td>44.0 kN/m</td>
</tr>
<tr>
<td>Tear Strength (Split)</td>
<td>ASTM D470</td>
<td>16.0 kN/m</td>
<td>10.5 kN/m</td>
</tr>
<tr>
<td>Stress at Break</td>
<td>ASTM D412</td>
<td>12.0 MPa</td>
<td>12.0 MPa</td>
</tr>
<tr>
<td>Abrasion Loss</td>
<td>DIN 4649</td>
<td>87 mm³</td>
<td>165 mm³</td>
</tr>
<tr>
<td>Shrinkage (30°C)</td>
<td>–</td>
<td>&lt; 0.5%</td>
<td>&lt; 0.5%</td>
</tr>
</tbody>
</table>
WRM Premium – Products line offers improved processing conditions for a quick return to service

- Part A contains < 0.08% free isocyanate
- Non-hazardous curative system
- No mercury based catalyst

- Part B is specially formulated to promote a uniform reaction rate ensuring **one single application & avoiding rework**
- WRM Premium offers a **quick hardness and toughness build up** allowing a faster return to service

**Typical Hardness Development**

<table>
<thead>
<tr>
<th>Mix</th>
<th>30 minutes</th>
<th>60 minutes</th>
<th>90 minutes</th>
<th>120 minutes</th>
<th>180 minutes</th>
<th>24 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0%</td>
<td>20%</td>
<td>40%</td>
<td>60%</td>
<td>80%</td>
<td>100%</td>
</tr>
</tbody>
</table>

WRM Premium 65T

80% of the hardness develops in first 60-90 minutes
WRM Premium – Products line offers outstanding physical properties…

...for a longer lifetime in challenging environment

Key benefits

Compared to industry standard, WRM Premium line offers

- **Improved sliding wear resistance**
- **Up to double abrasion resistance** due to higher rebound
- **Excellent property retention in hot & wet, acid and alkaline environments**

![Graph showing Abrasion Loss (mm³) and Hydrolytic Resistance 80°C immersion](image)

- **Abrasion Loss (mm³)**
  - WRM 80T: 117
  - WRM Premium 80T: 87
  - Market standard: 273

- **Hydrolytic Resistance 80°C immersion**
  - WRM Premium 65T
  - WRM
  - WRM Premium 80T
  - Market standard
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WRM application requires few easy steps

https://www.youtube.com/watch?v=0U_ZTX0oYoQ

Clean the damaged area

Apply the primer, if required

Pour Part B into Part A
Mix for 3 minutes

The material will completely cure in 24 at room temperature

The pourable liquid produced when mixing parts A & B may be used for simple casting jobs

Add Part C only if thixotropic properties are desired

Note: Primer may be required depending on substrate chemistry or adhesion required
Surface preparation is key to reach great coating performance

Efficient cleaning of the surface can be achieved by mechanical or/and chemical treatment

- **Substrate**: Steel, Nitrite Rubber, Fiberglass Reinforced Plastic, Plastic Foam & Urethane
- **Mechanical**: Steel grid or Blast Sand or Illmeite
- **Chemical**: Solvent
- **Steel**: Brush or grind the surface & Wash with solvent
- **Nitrite Rubber**: Lightly abrasive or 80 grit abrasive paper & Wash with solvent & dry
- **Fiberglass Reinforced Plastic**: Solvent wash
- **Plastic Foam & Urethane**: No adhesion to polyethylene and other engineering plastic

For further information, refer to LANXESS “surface preparation guide”

Always use safety equipment and consult solvent MSDS
LANXESS developed a complete range of primers for different substrates

**Few easy steps for efficient primer application**

**MIXING**
I. Pour all of the Part B into the Part A can
II. Mix with a spatula or paddle scraping

**APPLICATION**
Use a brush or roller to apply the primer

**CLEANING THE EQUIPMENT**
Wash brushes and rollers with MEK or Acetone solvent

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- Great coverage
- Available in different packaging sizes
- A solution for each substrate

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### Properties

<table>
<thead>
<tr>
<th>Properties</th>
<th>WRM Primer Urethane</th>
<th>WRM Primer Metal</th>
<th>WRM Primer Rubber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate</td>
<td>Urethane, PVC &amp; RFP</td>
<td>Metal</td>
<td>Natural &amp; some synthetic rubber</td>
</tr>
<tr>
<td>Coverage(^1) of 1kg</td>
<td>6-8 m(^2)</td>
<td>10 m(^2)</td>
<td>4m(^2)</td>
</tr>
<tr>
<td>Working time</td>
<td>1h</td>
<td>20 min</td>
<td>1h</td>
</tr>
<tr>
<td>Drying Time</td>
<td>30-45 min</td>
<td>20 min</td>
<td>5-45 min</td>
</tr>
</tbody>
</table>

\(^1\) Coverage will vary depending on the surface texture of the part.
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WRM – A perfect system to repair highly worn and damaged areas

**CONVEYOR BELTS**

- **Conveyor belts** are one of the most critical pieces of mining infrastructure and constantly exposed to high impact and sliding wear.

- WRM advantages
  - Good chemical & water resistance
  - Very good **impact & abrasion resistance** compared to harder epoxy repair products
  - Easy handling – No need for high temperature and pressures required for rubber vulcanizing processes
WRM – A proven solution to decrease maintenance costs

Vibratory bowl feeders are made from aluminum and used to feed individual component parts in a production line – parts were coated with WRM 80T

Results
- Higher wear and tear resistance
- Better hydrolytic and oil stability
- Very good shock and noise absorption

WRM advantages
- Easy handling as no oven nor heating required
- Cost and downtime savings as repairing can be done in-site
WRM – Extending lifetime is driving cost savings in the mining spiral separator applications...

**CASE STUDY – BRAZIL (1/2)**

**SPIRAL SEPARATOR**

- Using gravity separation techniques the spiral surface is constantly submitted to abrasive mineral slurries, resulting in **surface damage** and therefore flow changes
- Any change in the spiral profile **reduces yield and profits**
- Equipment made of epoxy and fiberglass
...by avoiding the purchase of new equipment

**CASE STUDY – BRAZIL (2/2)**

<table>
<thead>
<tr>
<th>After 24 months operations</th>
<th>After repairing</th>
<th>SPIRAL SEPARATOR</th>
</tr>
</thead>
</table>

WRM repairing kit allows **80% savings on new equipment**
- When repaired with WRM, the spiral separator lifetime is similar to a new part (~18-24 months)
- Over USD 10,000 savings for each part
  > New line of spiral separator price is USD 15,000 in Brazil
  > Repairing cost of a spiral separator is about USD 3,000 (material cost and manpower)

**Delivering time** is also a benefit as the repairing part are delivered within weeks while time to deliver new equipment is about 4-6 months.
WRM repairing kit can be used for a broad range of applications

- Roll lagging
- Scrapers
- Impellers
- Mill lining
- Lifter bars
- Discharge shoot

We can help you to find yours!
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Unless specified to the contrary, the values given have been established on standardized test specimens at room temperature. The figures should be regarded as guide values only and not as binding minimum values. Kindly note that the results refer exclusively to the specimens tested. Under certain conditions, the test results established can be affected to a considerable extent by the processing conditions and manufacturing process.