



Rust Preventives based on Water as Solvent Challenges and Advantages

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Agenda

- Introduction of LANXESS Lubricant Additives
- The Importance of Corrosion Protection
- Comparison of Rust Preventives based on organic Solvents or on Water as Solvent
- Water-based vs solvent-based RP Application Procedure
- Emulsifiable water-based Corrosion Inhibitor – Test Results
- Summary



Lubricant Additives – is a leading specialty solutions provider to the global lubricants value chain

Our Value Chain

Synthetic Basestocks & Intermediates

- High viscosity PAO
- Specialty Esters
- DPA

Additives

- Antioxidants
- Detergents
- Extreme Pressure
- Anti-wear
- Corrosion Inhibitors
- Specialties

Packages*

- Industrial Packages

Finished Fluids

- Synthetic Industrial Fluids
- Aviation Fluids
- Fire-resistant hydraulic fluids
- Specialty Greases

Attractive
Global
Industries



Transportation Additives



Industrial Additives



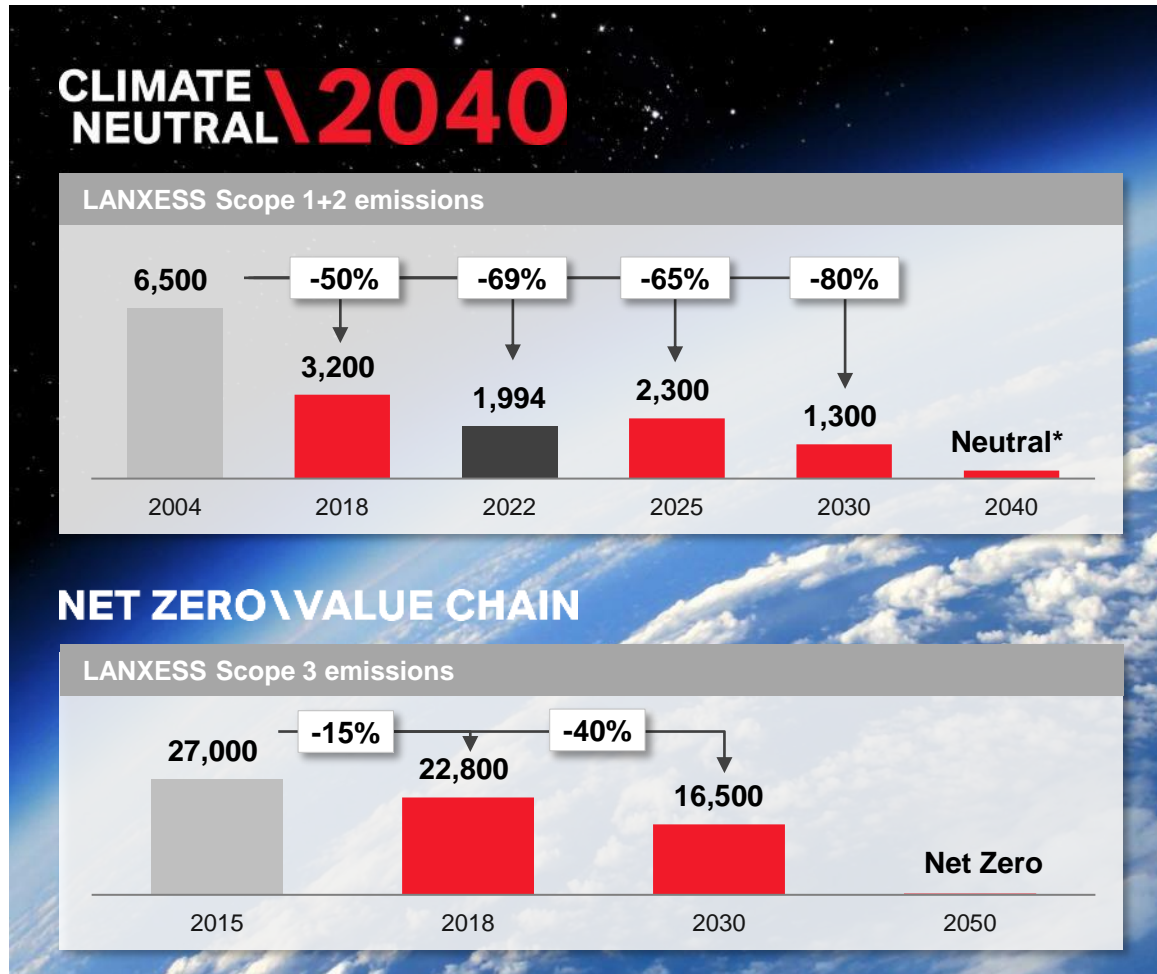
Synthetic Basestocks & Fluids

Our DNA

- Unique integrated portfolio for lubricants
- Premium products meeting highest standards
- Striving for innovation and technology leadership
- Long track record of providing technical expertise to customers
- Strong technical and analytical capabilities with decades of experience
- Applying highest standards for safety and sustainability

Climate Protection and Energy Efficiency

Climate Neutral 2040 and Net Zero Value Chain



With “Climate Neutral 2040” we have a clear roadmap and defined levers to reduce scope 1+2 emissions.

- Realize major impact projects for climate protection
- Decouple emissions and growth
- Pursue technological innovations

“Net Zero Value Chain” aims at reducing and ultimately neutralizing scope 3 value chain emissions.

- Make use of sustainable raw materials
- Transition to green logistics
- Increasingly offer low-carbon and climate-neutral products



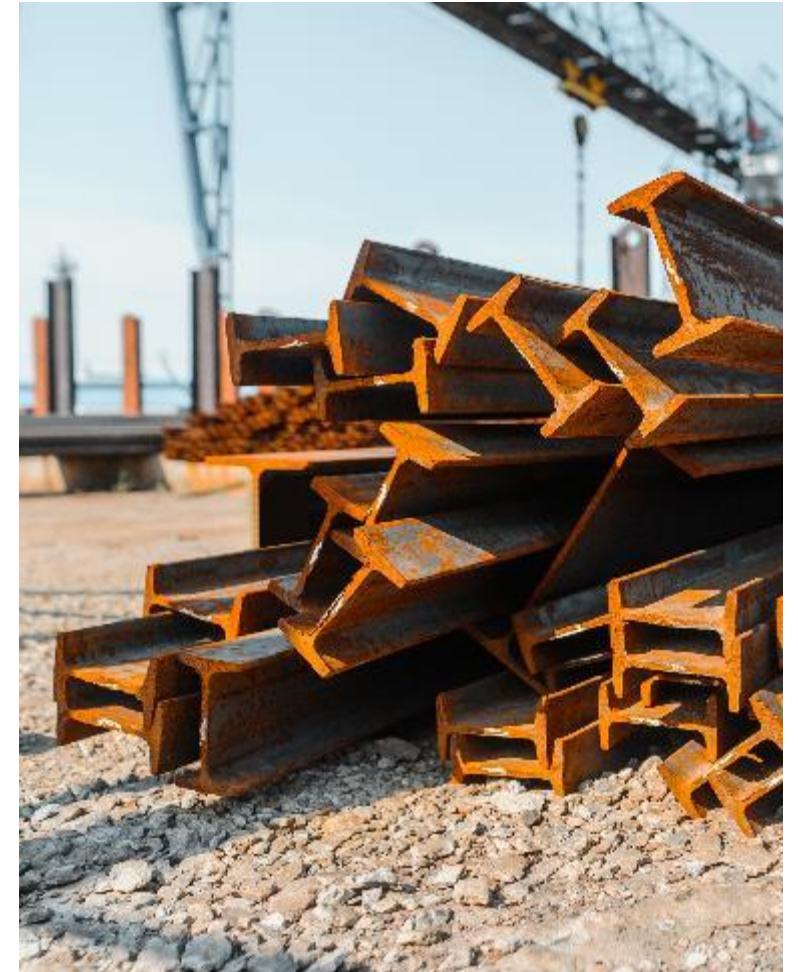
SBTi approves: Our targets contribute to limiting global warming to 1.5°

• <300kt CO₂e emissions per year, reduced by compensation measures

The Importance of Corrosion Protection

Corrosion during storage and transport

- Corrosion generates more damage than fatigue
- Annual costs of corrosion globally 2.5 trillion Dollar, approx. 3.4% of GDP
- Annual direct costs of corrosion in the US 276 billion Dollar, 3.1% of GDP
- Manufacturing industry: corrosion of semi-finished parts and machined parts during transport and storage
- Reasons for corrosion during transport and storage:
 - Bad weather conditions, changing climates during overland transport
 - Seawater impact during maritime transportation
 - High humidity storage conditions
- Temporary corrosion protection by application of rust preventives



Rust Preventives containing Organic Solvents

Advantages

- Established process
- Short drying times
- Easy disposal – can be burned
- Non-complex formulations

Disadvantages

- Volatile Organic Compounds
 - Green house gas – global warming
 - Ground level ozone
 - Harmful
 - Restrictions in many countries
 - Solvent vapors require exhaust gas treatment
- Highly flammable
- High water pollution classification

What if using Water as Solvent?

Advantages

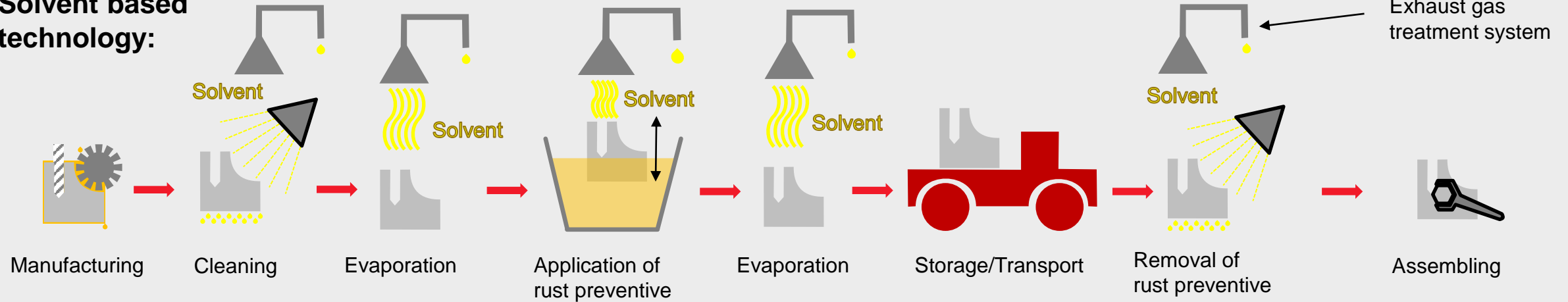
- No VOC release
- No exhaust gas treatment required
- Not flammable
- Lower water pollution classification
- Lower quantity for transport and storage
- Easy disposal

Challenges

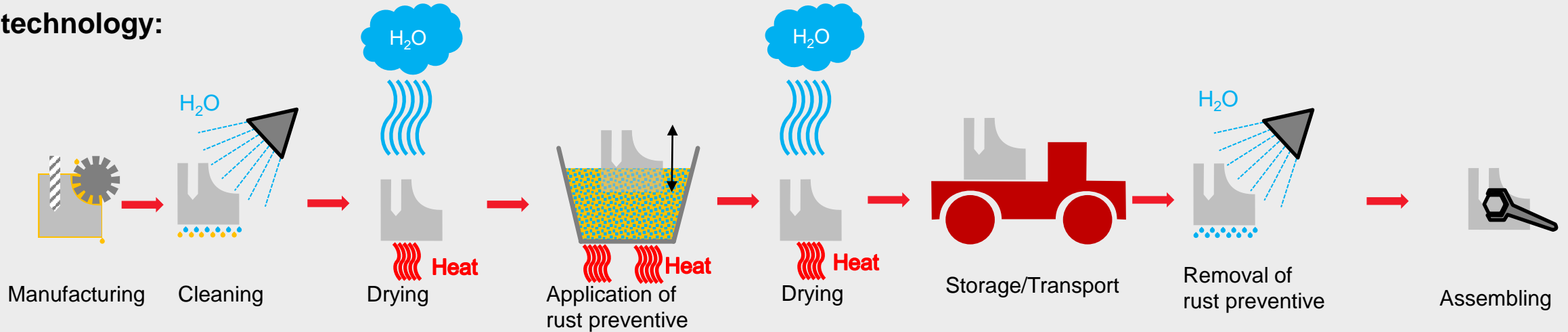
- Longer drying time
- Process has to be adapted

Water as Solvent in Comparison with Organic Solvents

Solvent based technology:



New water based technology:



Oil containing, emulsifiable Corrosion Inhibitor Package

Test Results



Appearance of an emulsifiable corrosion inhibitor package

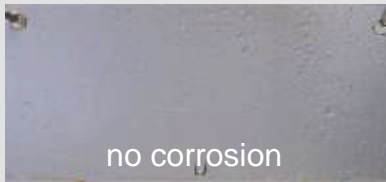
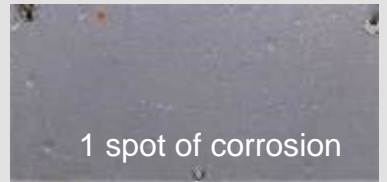


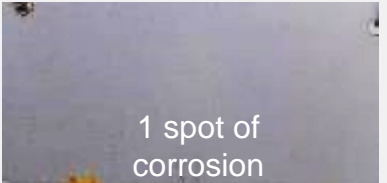
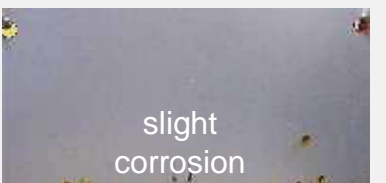
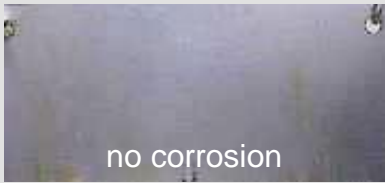
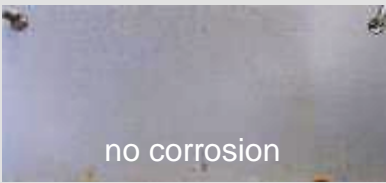
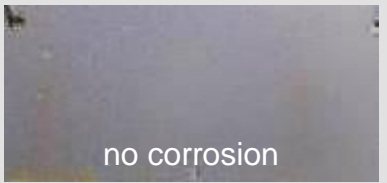
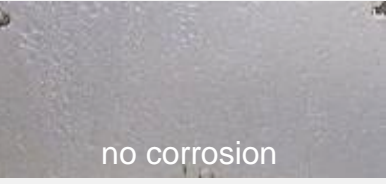





Final RP after blending with water



Salt Spray Test Results

ASTM B117 / ISO 9227

		After 26 h	After 30 h	After 33 h	After 36 h
Oil based RP based on Corrosion inhibitor 10% Mineral oil grp.I 90%		 no corrosion	 no corrosion	 1 spot of corrosion	 1 spot of corrosion
Mineral oil grp.II 10% Emulsifiable CI 10% Water 80%		 no corrosion	 1 spot of corrosion	 1 spot of corrosion	 slight corrosion
TMPTO 10% Emulsifiable CI 10% Water 80%		 no corrosion	 no corrosion	 no corrosion	 Slight corrosion
Naphthenic oil 10% Emulsifiable CI 10% Water 80%		 no corrosion	 no corrosion	 no corrosion	 1 spot of corrosion
Mineral oil grp.I 20% Emulsifiable CI 10% Water 70%		 no corrosion*	 no corrosion*	 no corrosion*	 Slight corrosion

Condensation alternating Climate

178 cycles



10% Mineral oil grp I
10% Emulsifiable CI
80% Water

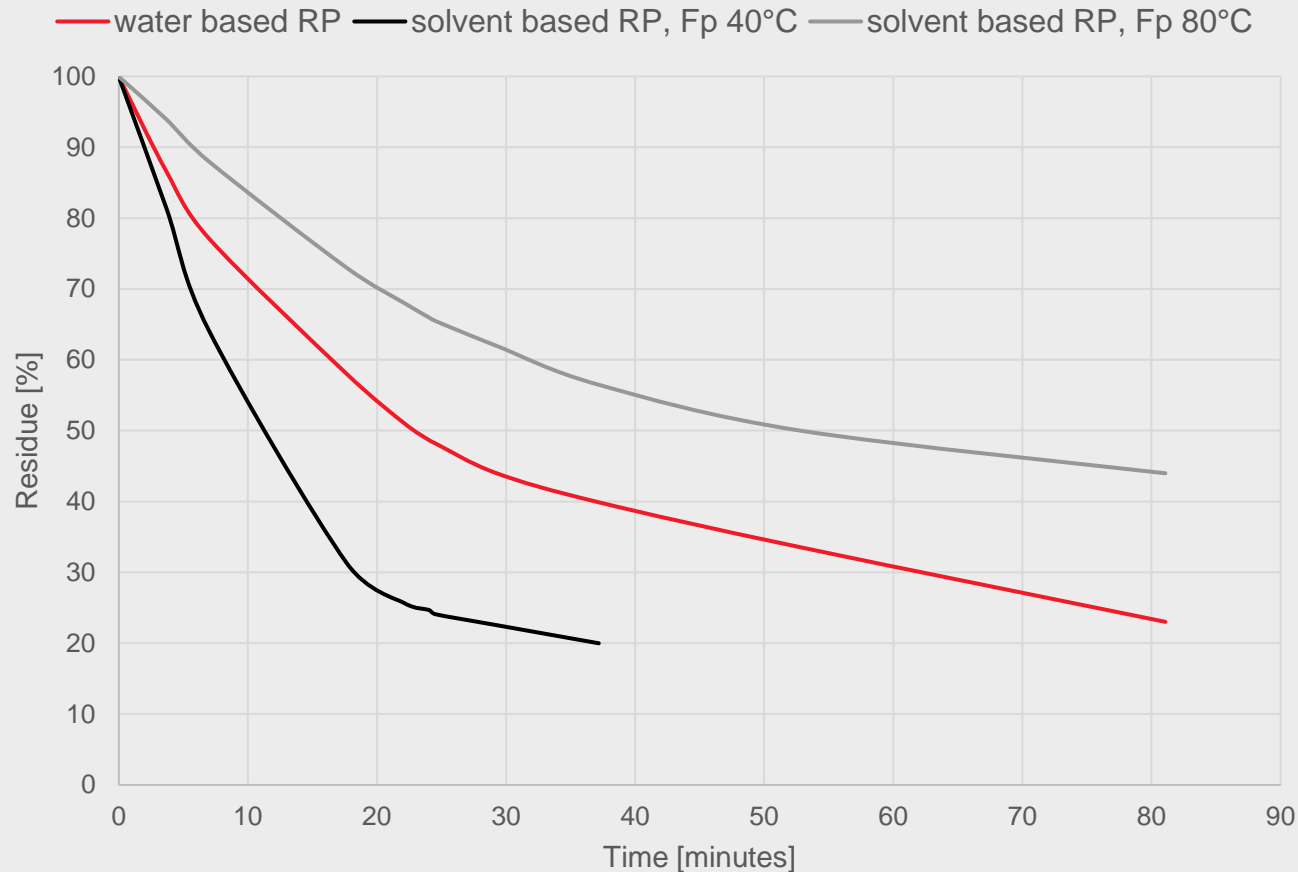
220 cycles



20% Mineral oil grp I
10% Emulsifiable CI
70% Water

- Testing the anticorrosion performance in a condensation climate with alternating humidity and air temperature
- Test procedure acc. to ISO 6270-2
- Cycle:
 - 8 hrs at 40°C (104°F) and 100% relative humidity
 - 16 hrs at ambient temperature (64 – 82°F) and humidity
- Test stopped at 5% corrosion

Comparison of Drying Time



- Solvent based RPs:
 - 10% CI additive
 - 10% Grp.I mineral oil
 - 80% Solvent
- Water based RP:
 - 10% CI additive
 - 10% Grp.I mineral oil
 - 80% Water
- Test conditions:
 - Moisture Analyzer, 40°C

Summary and Conclusion



A great alternative to meet today's environmental requirements

- The new emulsifiable corrosion inhibitor technology offers excellent performance for long term temporary corrosion protection
- No emission of VOCs
- No heavy metals like barium
- Formulated RP is not flammable
- Salt spray protection and condensation alternating climate protection comparable to oil-based rust preventives
- Excellent emulsion stability even at high water hardness

LANXESS

Energizing Chemistry

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