Chemetall

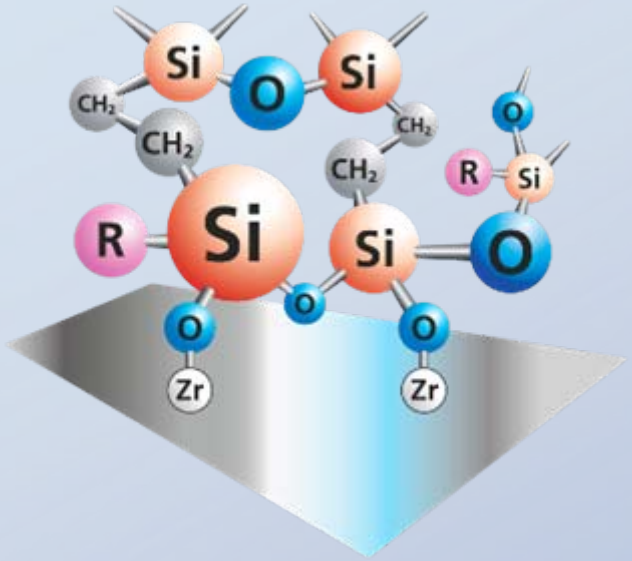
Welcome to our Online Seminar:

Oxsilan® - The Eco-Friendly Solution for Metal Pretreatment

- simpler, more economical, and more efficient

Agenda

1. The company Chemetall
2. Drivers for new technologies
3. Oxsilan® – The eco-friendly solution for ZnPh replacement
   a. Chemistry
   b. Process comparison: Oxsilan vs. ZnPh
   c. Cost advantages
4. Oxsilan® case studies
5. Summary



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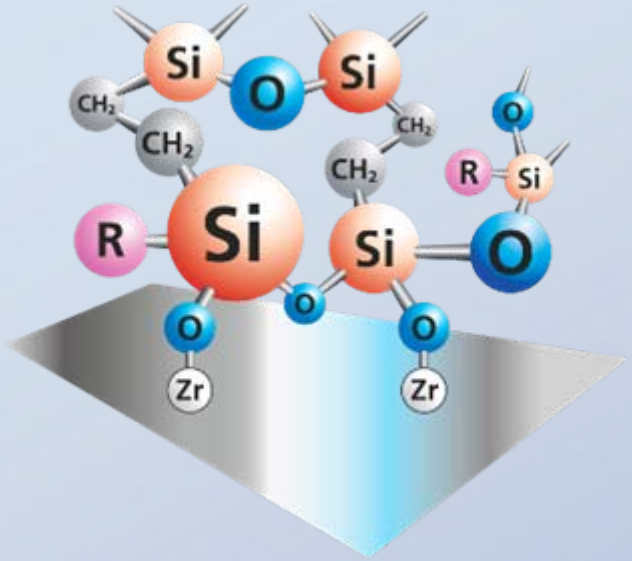
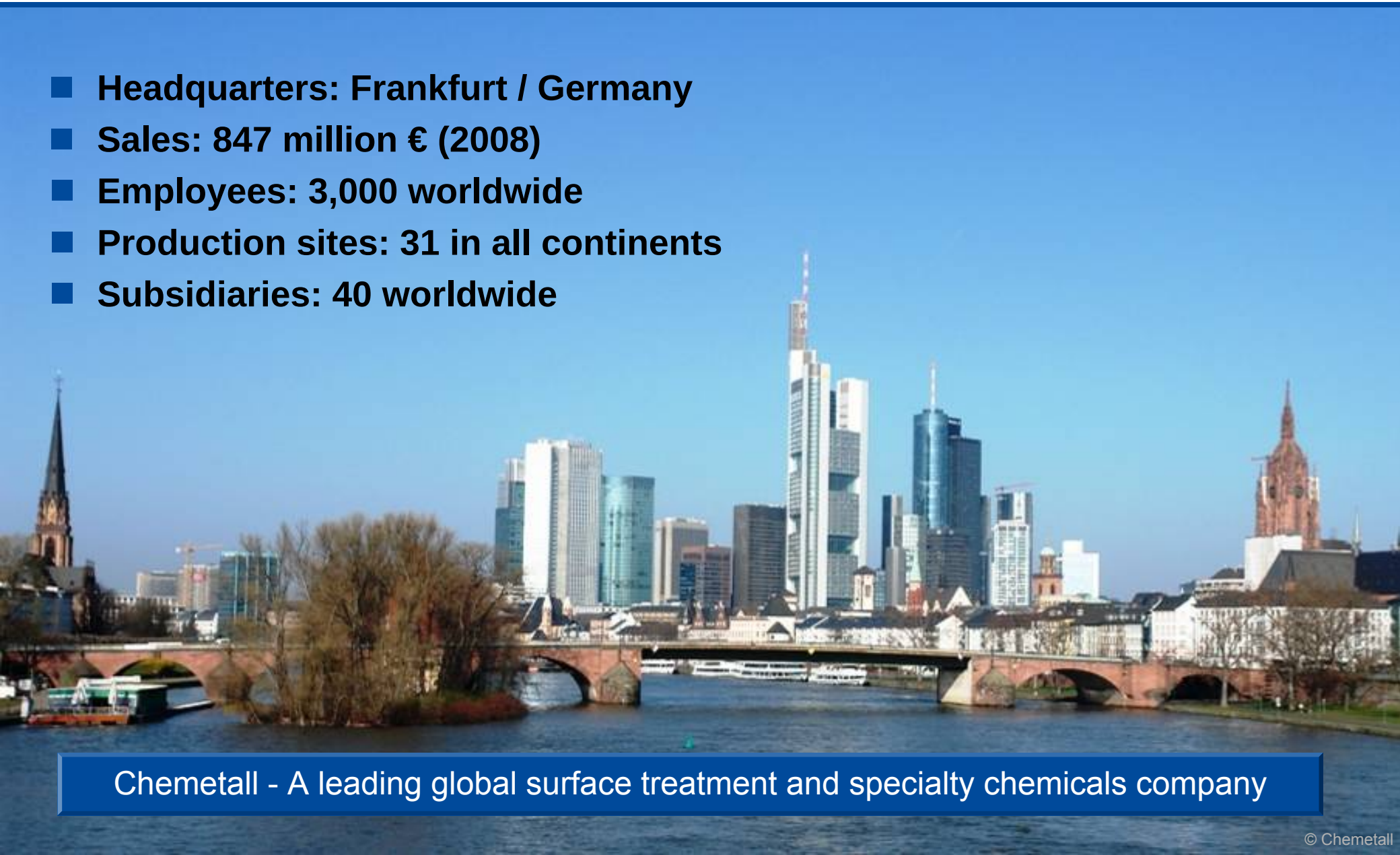


At a Glance

Chemetall

- **Headquarters: Frankfurt / Germany**
- **Sales: 847 million € (2008)**
- **Employees: 3,000 worldwide**
- **Production sites: 31 in all continents**
- **Subsidiaries: 40 worldwide**



Chemetall - A leading global surface treatment and specialty chemicals company

Surface Treatment – Products and Processes

Chemetall

- Cleaners and etchants
- Corrosion protection
- Conversion coatings including chrome-free pretreatments
- Thin organic coatings and primers
- Lubricants for cold forming
- Chemicals for waste water treatment
- Paint strippers and paint detackification
- Non-destructive testing materials and equipment
- Aircraft sealants

Markets

Auto Components

- Wheels
- Shock Absorbers
- Engine Parts
- Plastic Fascia
- Components

Automotive

- Cars
- Trucks
- Busses

Coil

- Steel Mills
- Aluminum Mills
- Job Coater
- Service Center

Cold Forming

- Tube
- Wire
- Extrusion

Aerospace

- Aircraft manufacturing, operation and overhaul
- NDT

General Industry

- Appliances, HVAC
- Cans
- Heavy Equipment
- Aluminum Finishing

Extensive expertise network gained through operating in various markets

Technical Services (Abstract)

Chemetall

ED-Coat Application

Coil Coat Application

Powder / Spray Coat

Corrosion Tests

Analytics

Outdoor Exposure

Expertise and a broad range of technical services for our customers' success

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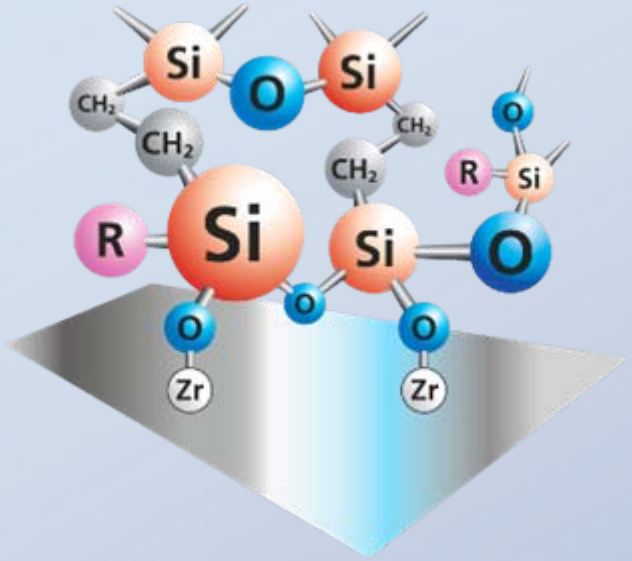
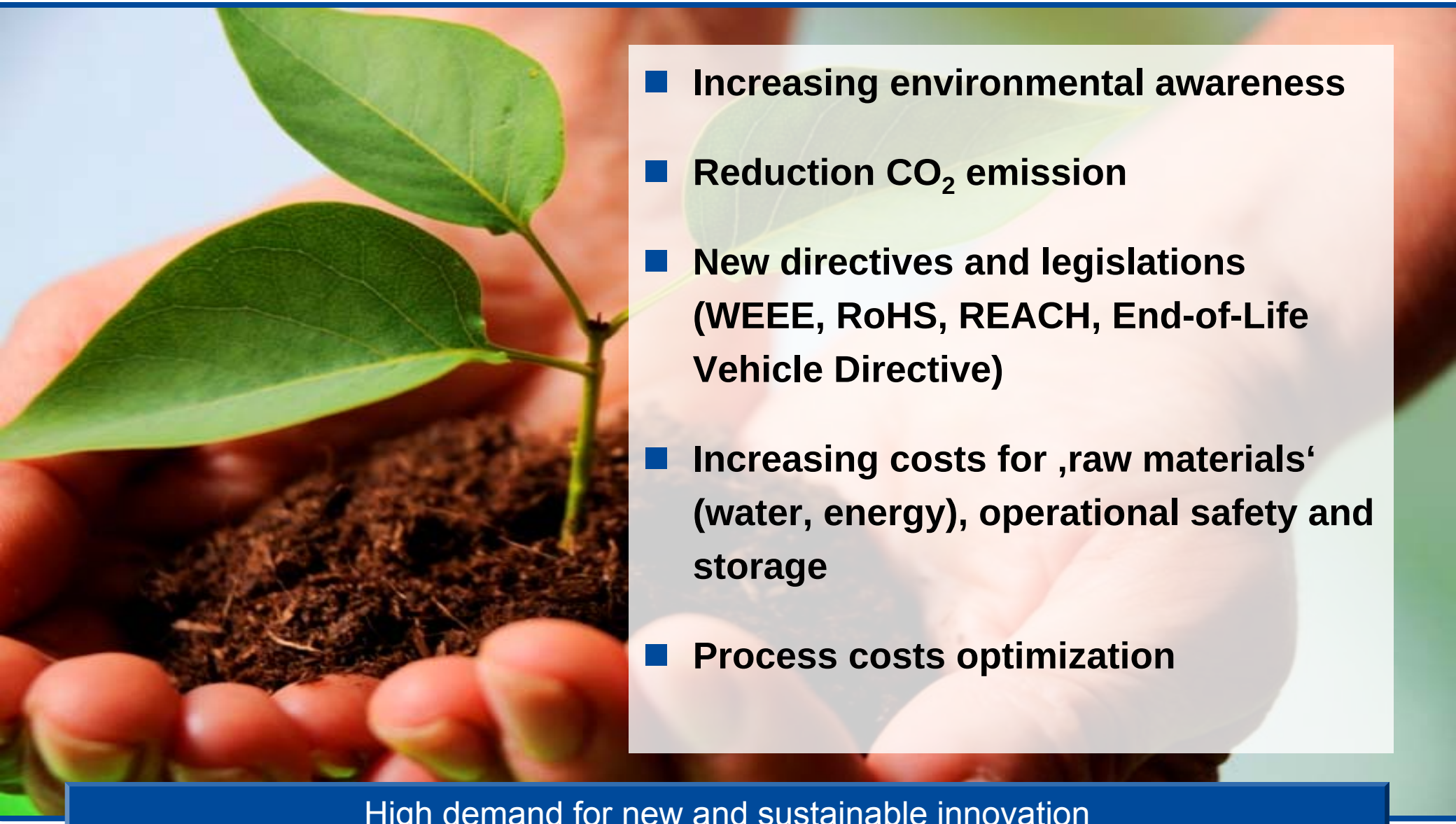


Drivers for New Technologies (I)



- Increasing environmental awareness
- Reduction CO_2 emission
- New directives and legislations (WEEE, RoHS, REACH, End-of-Life Vehicle Directive)
- Increasing costs for ‚raw materials' (water, energy), operational safety and storage
- Process costs optimization

High demand for new and sustainable innovation

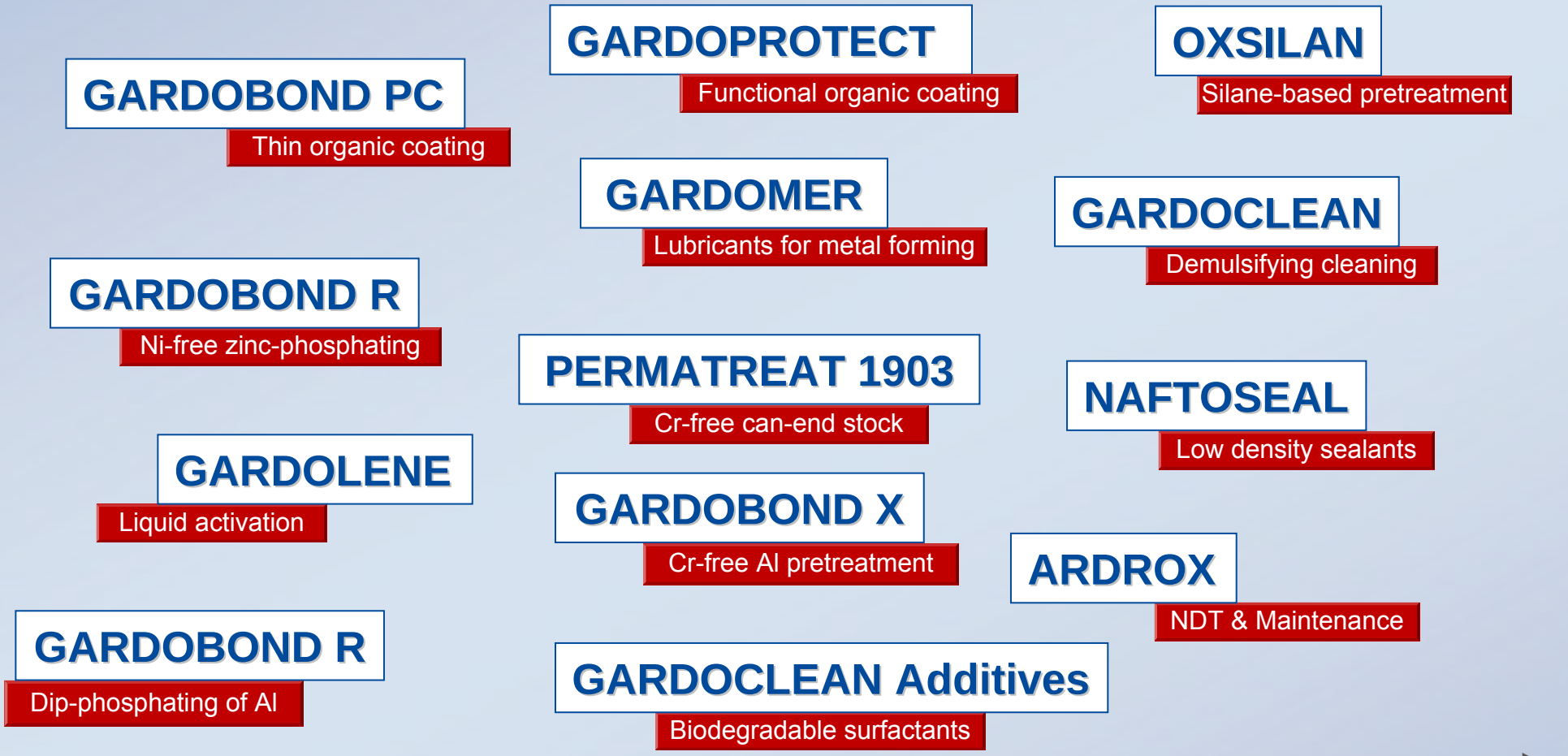
Drivers for New Technologies (II)

Process cost savings:

- Less energy and water
- Less maintenance
- Simplified processes
- Less chemical usage
- Shorter treatment time

Technologies Innovated by Chemetall (Abstract)

Chemetall



Chemetall is the leader in innovation for surface treatment technologies

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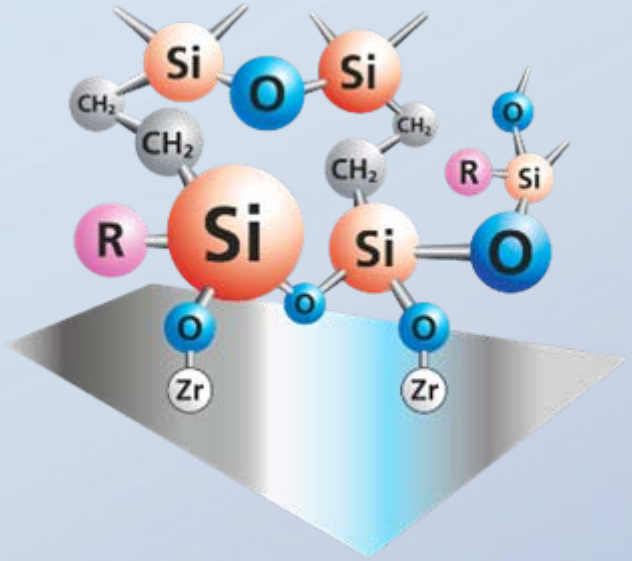
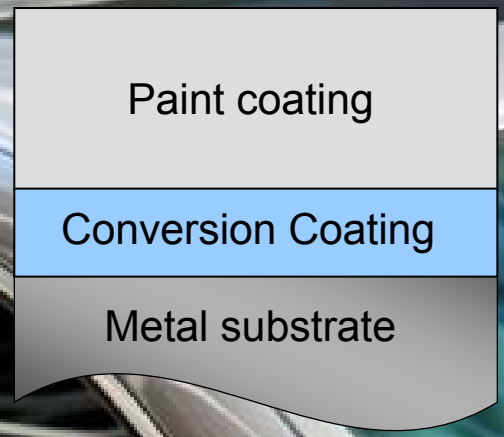


What is a Conversion Coating?

- A coating formed by the reaction of a chemical with the substrate whereby the substrate becomes an integral part of the coating

- Example:
  - Iron phosphate
  - Zinc phosphate
  - Chromate
  - Alternatives, e.g. Oxsilan®

- Purpose: Improve performance of paint and corrosion protection



Oxsilan® - Customer Reference List (Abstract)

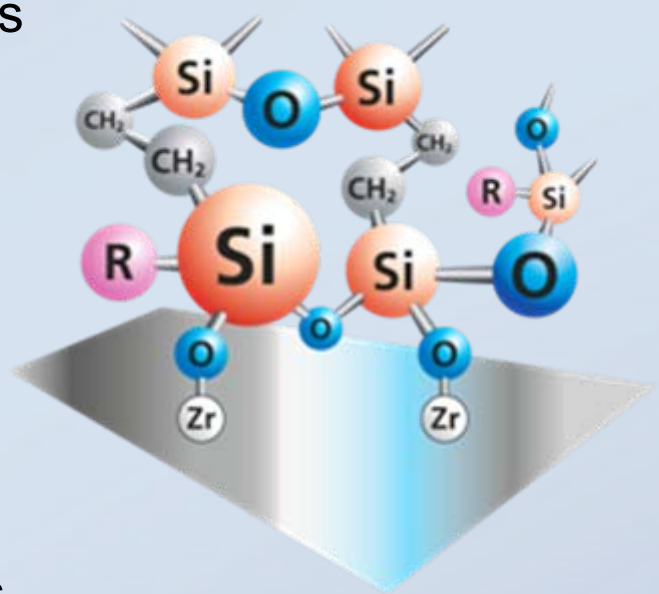
Chemetall

- More than 150 customers use Oxsilan® successfully
- Significant water and energy savings proven

Oxsilan® more than 10 years of successful usage, at more than 150 customers

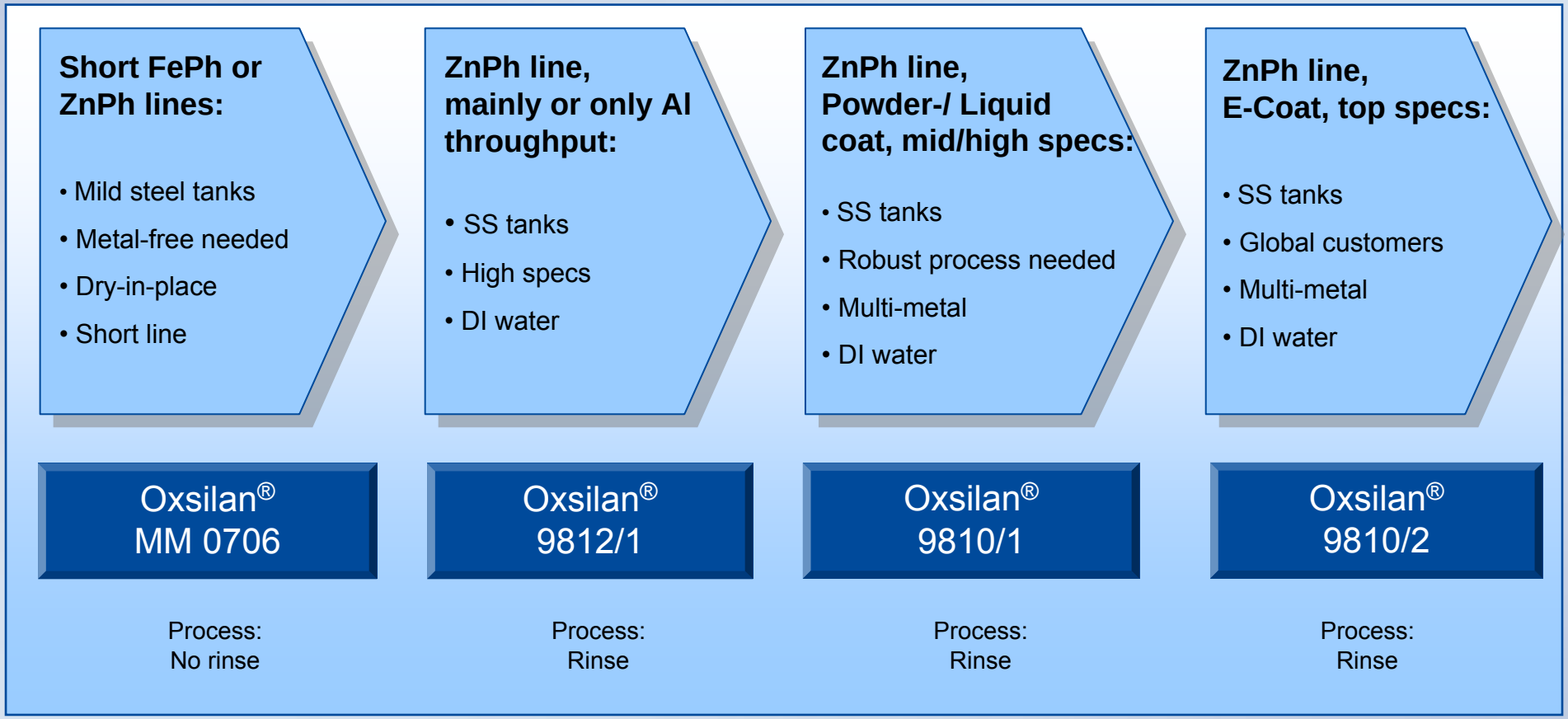
Oxsilan® - Basis of Chemistry

- Hybrid-polymer: Functional organo-silane polymers
- Composition
  - Zr-hexafluorid
  - Siloxan-Polymers
  - Additives



- Excellent paint adhesion and corrosion resistance
- No phosphate and no hazardous heavy metal ions such as Ni, Cr, …
- Oxsilan® for thin and functional coatings
- Suitable for all metal and multi-metal substrates

- The eco-friendly solution for ZnPh replacement:

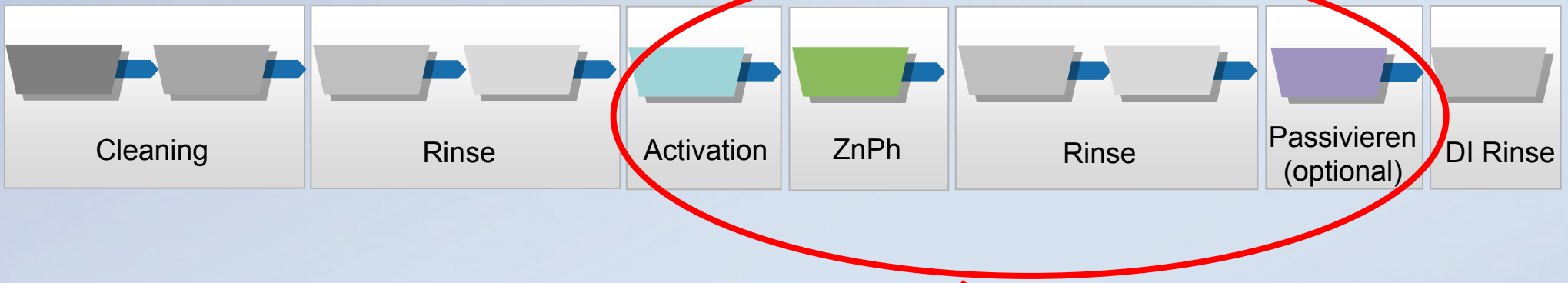


Broad product range for diversified demands

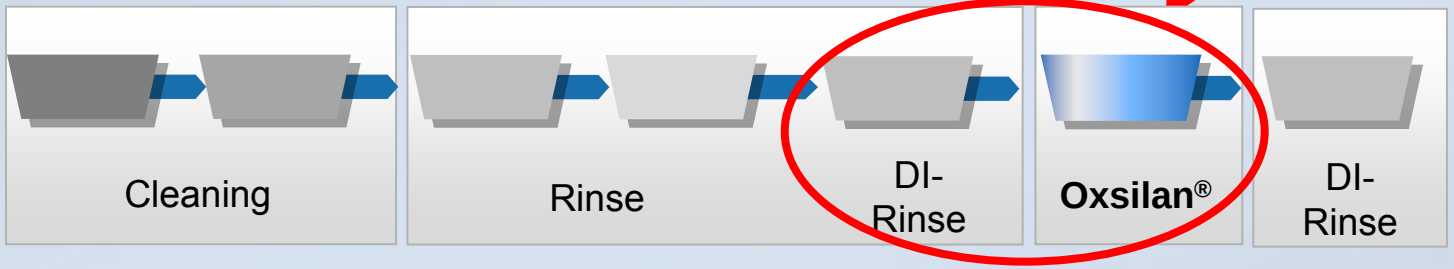
Process Comparison - ZnPh vs. Oxsilan®

Chemetall

Zinc-phosphate

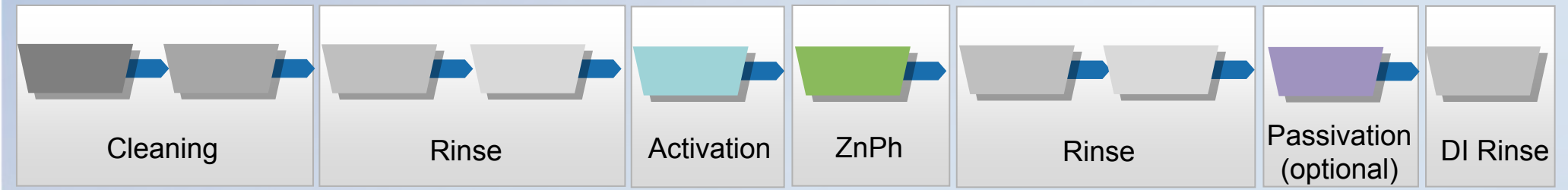


Oxsilan®



Oxsilan® - Only few steps to an economic and environmentally-friendly coating

Process Comparison - ZnPh-Process



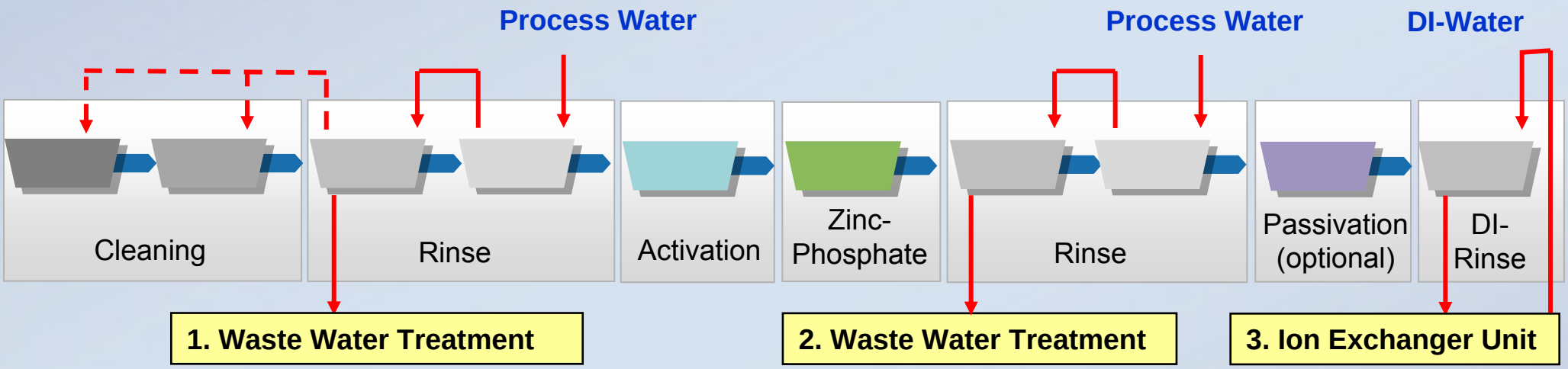
- Advantages
  - Fully developed technology
  - High quality
  - Worldwide standard

- Weaknesses
  - Contains heavy metals (Ni, Zn…)
  - High energy consumption (50 - 60 °C)
  - High water consumption (∑= 2 – 5 L/m²)
  - High production of waste water
  - Sludge production (CRS → 3…4 g/m², Aluminum → 8…12 g/m²)
  - Difficult process management
  - Activation and passivation stages needed

High quality and proven technology, with reducible environmental impact

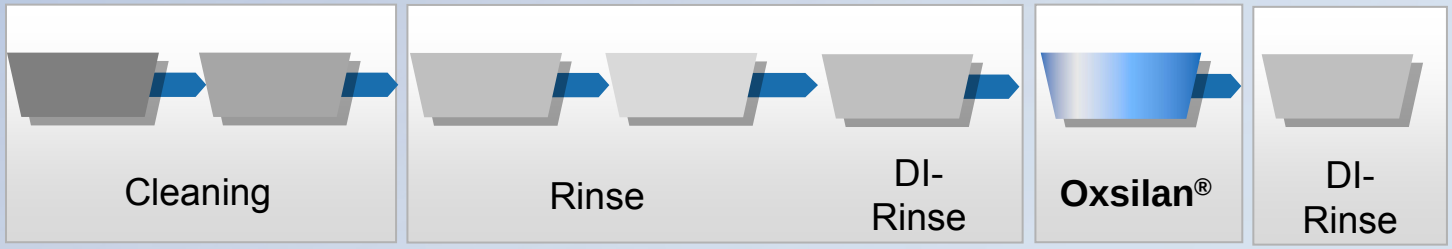
Process Comparison - ZnPh-Process

- Rinse water system



Difficult rinse water system, no closed loop

Process Comparison - Oxsilan® Process



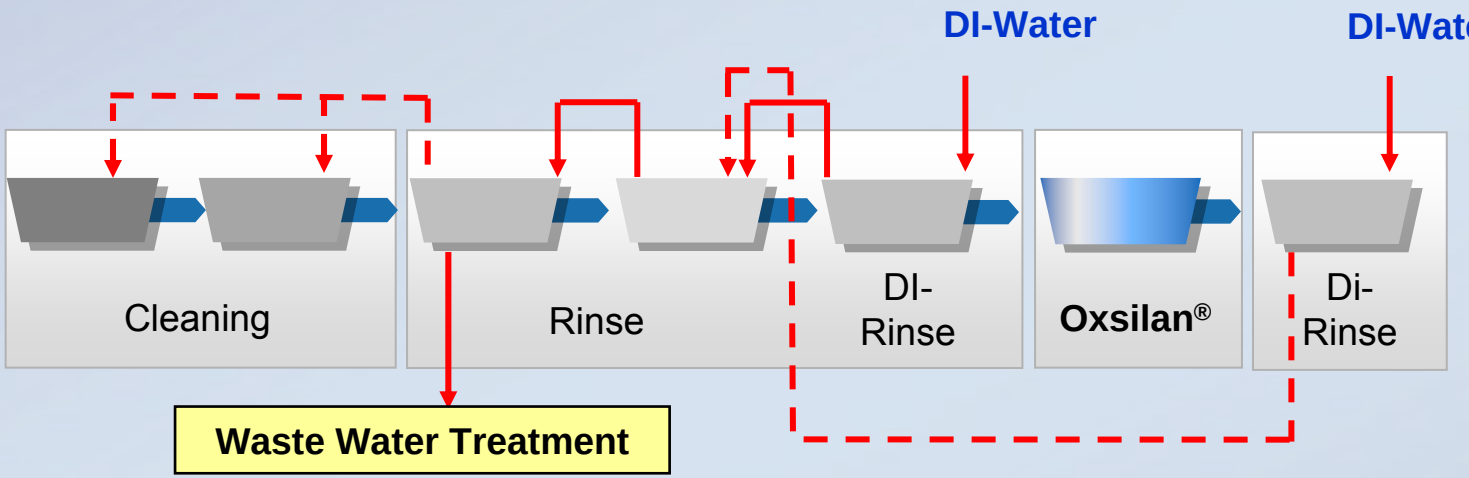
- Advantages
  - Easy drop-in replacement
  - Environmentally friendly (no Ni, Cr,…)
  - Operates at room temperature
  - Low water consumption (reduced capacity of DIW or ROW plant)
  - Low energy consumption
  - Nearly free of sludge (ca. 5 mg/m²), no filter press needed
  - Simple waste water treatment
  - Multi-metal; no limits as to Al
  - No activation or passivation step
  - Lower process time (60…120 seconds)

- Weaknesses
  - Good cleaning (rinsing) required
  - Not yet in all industries established process

Many advantages, one goal: Sustainable conversion coating

Process Comparison - Oxsilan® Process

- Rinse Water System

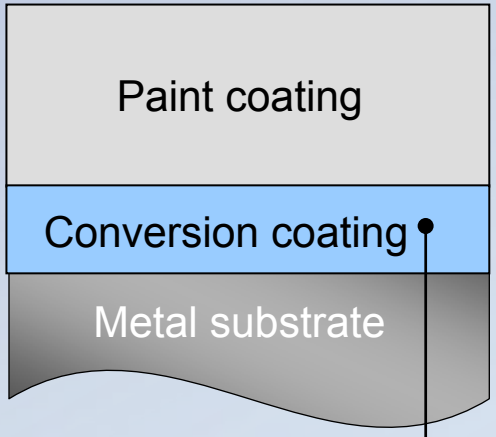


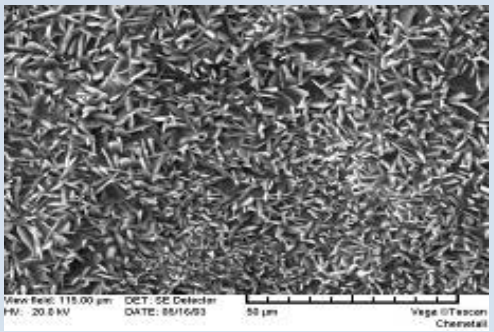
Ideal usage of rinse water , low water consumption

Process Comparison - Layout Coat Thickness

Chemetall

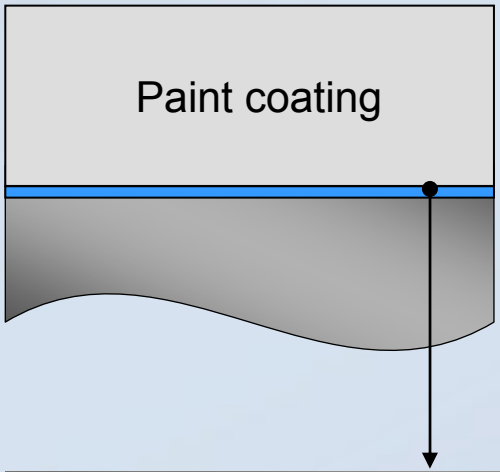
Zinc-Phosphate



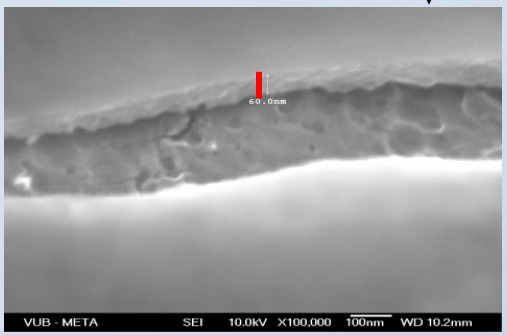


Coating Thickness	1-2 µm
Composition	Phosphophyllite Hopeite
Morphology	crystalline

Oxsilan®

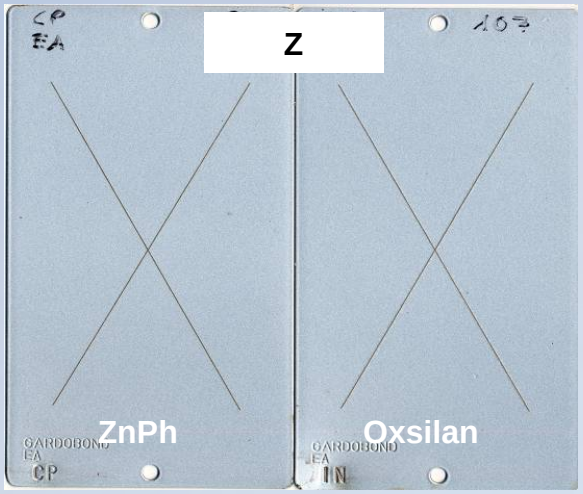


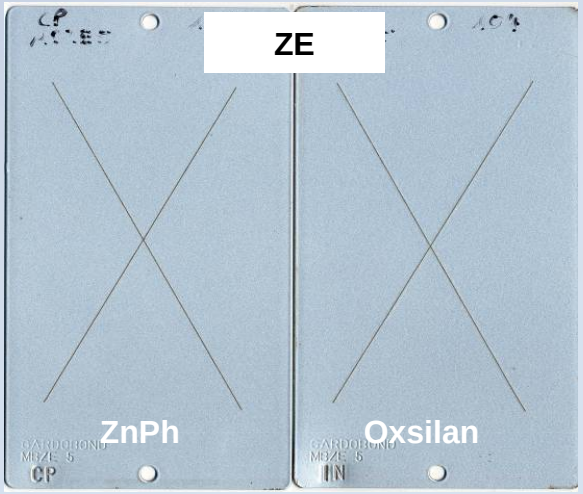
Coating thickness
50 - 150 nm

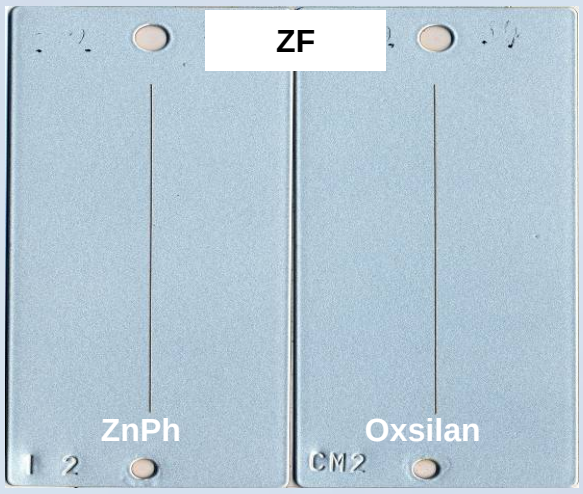


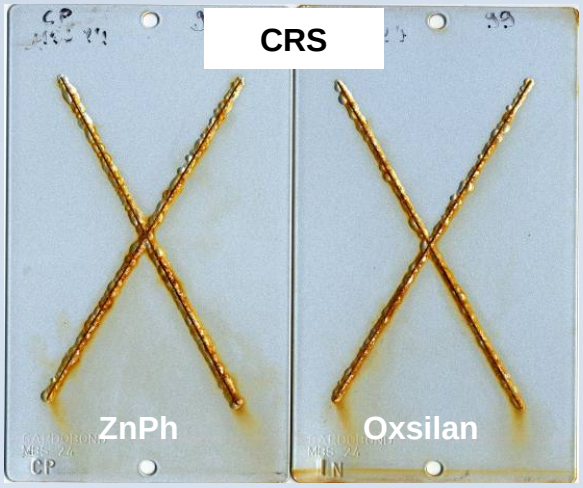
Coating Thickness	50 - 150 nm
Morphology	amorphous
Composition	Si 1 - 20 mg/m², Zr 10 - 250 mg/m²

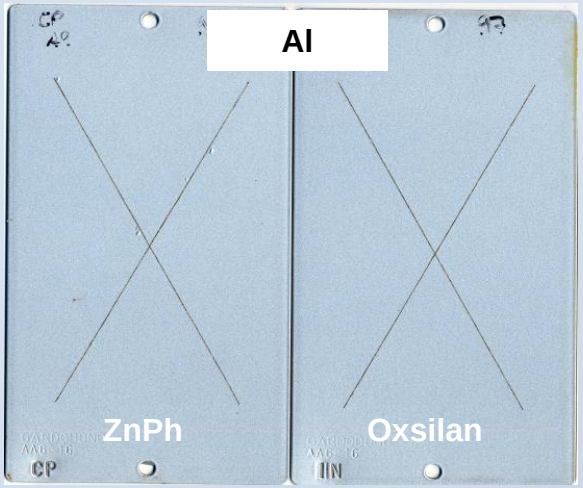
Oxsilan® - Lab Test Results











Product: Oxsilan + Additive

Paint: E-Coat, Primer, Topcoat, ~ 100 µm

Tests: Outdoor Exposure + NaCl, 12 Months

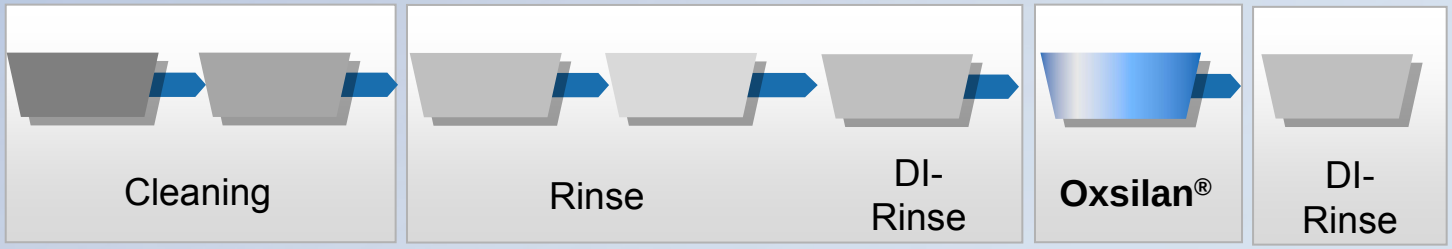
Outdoor exposure results comparable to those of ZnPh

Oxsilan® - Lab Test Results

Chemetall

Salt Spray Test 1,000 h (partly up to 2,000 h)	*DIN EN ISO 9227 NSS*	✓
VDA Climate Test	*VDA Prüfblatt 621-415*	✓
240 h Constant Humidity Test	*DIN EN ISO 6270-2 CH*	✓
CASS Test 504 h	*DIN EN ISO 9227 CASS*	✓
Filiform Corrosion Test	*DIN EN 3665*	✓
Corrosion Cyclic Test PV1210		✓
GMW 14872		✓

Oxsilan® - Process (9800-series)



Make-up & Replenishment	Bath Control & Maintenance	Bath Parameter	Coating Control
■ DI-water ■ Oxsilan solution ■ Inorganic solution ■ pH adjustment solutions ■ Equipment materials: stainless steel	■ Overall Parameters: pH-value, conductivity ■ Silane Components (Photometry, XRF) ■ Inorganic Component (Titration, XRF) ■ Filtration (< 25 µm): recommended	■ Spray or dip ■ 1 to 3 min treatment time ■ pH 4,0 - 4,8 ■ Temperature 20 to 40 °C ■ Conductivity 1,000 – 3,500 µS/cm	■ XRF ■ Zirconium, Silicon

Process Comparison - Control Parameters

Chemetall

	ZnPh Process	Oxsilan Process
Cleaner	FA, TA, pH	FA, TA, pH
Activation	pH	-
Conversion Coating	Free Acid Total Acid (Free Fluoride) (Total Fluoride) Zinc (Nickel) (Manganese) Accelerator	pH, Conductivity Titration Photometric
Passivation	pH, Conductivity, Passivation Points	-
Test Frequency	1 – 3 x per shift	1x per day

Oxsilan® - Process Cost Savings

- Energy and water consumption per 100 sqm

	ZnPh Process	Oxsilan®
Energy Consumption (kWh)	57 kWh	35 kWh
Water Consumption (liter)	200 – 500 L	50 – 100 L

Savings due to Oxsilan®: 40% energy and 50% water

Oxsilan® - Process Cost Savings

Chemetall

- Potential cost savings with Oxsilan® for new plant

Installation costs (shorter pre-treatment, no activation/passivation)	12%
Energy costs (less agitation and heat exchanger operations in Oxsilan® bath)	3%
Water costs (waste water treatment, capacity)	5%
Total savings	**20%**

20% investment savings on new plants due to Oxsilan® Technology

Oxsilan® - Process Cost Savings

Chemetall

- Potential cost saving with Oxsilan® - practical experience*

Reduction of heating energy in phosphating bath *(bath size 10 m^3)*	90 k EUR
No disposal costs for sludge	5 k EUR
Reduction of VE water consumption	15 k EUR
Reduction of heater circuit maintenance	30 k EUR
No acid rinsing with extra manpower	25 k EUR
No electrical energy	20 k EUR
Savings in waste water treatment	175 k EUR
Total cost reduction due to Oxsilan®	**360 k EUR**

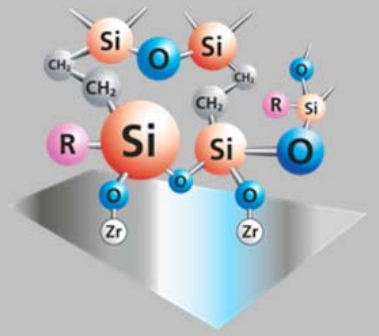
* German automotive components manufacturers

Oxsilan® offers high potentials on savings

Oxsilan® - Calculation Tool

Chemetall

OXSILAN



OXSILAN Evaluator
for the OXSILAN 98xx-series
as a ZnPh replacement

This calculation tool will support you to find out the process cost savings when converting your current ZnPh process to OXSILAN.
With your input of process data it calculates the current process costs and product costs and compares it to the OXSILAN process and product costs. Finally you have the results on the 3 result sheets (Results, Result Charts, CO2-Balance).
So please go through this evaluator step by step and insert your data in the white fields on the 2 input sheets ("Input General Data" + "Input Process Data").

Apart of the requested ZnPh and OXSILAN process steps at the "Input General Data" sheet please insert only numbers, no letters or anything else! The process steps must be inserted precisely like mentioned below the table.

Instead of "Euro" you can insert the figures in your local currency. But then please note that any result displayed in Euro is actually the result in your local currency.

Start

For any questions or necessary information please contact the author: werner.rentsch@chemetall.com

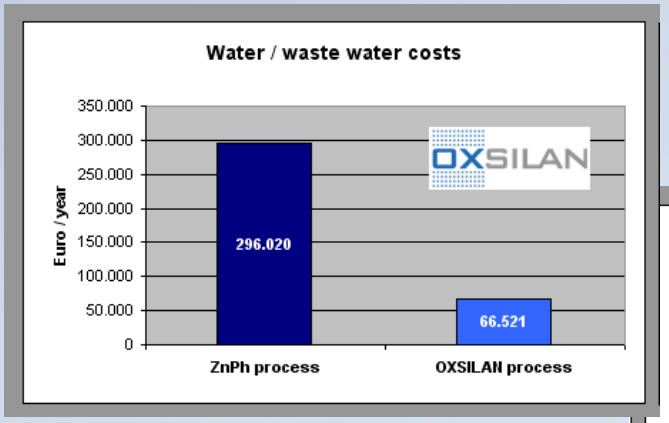
	Units	Stage 1 Cleaner	Stage 2 Cleaner	Stage 3 Cleaner	Stage 4 Cleaner	Stage 5 Rinse
	m³/h					
	m³/h	0,3				2,4
	m³/h					
.)	kWh	44,7	11,5	73,5	15	15
	m³/h					
	kWh		11			
	m³/h		14.000			
	°C	53	53	53	47	44
ain)	°C	20	20	20	20	20
	m³	8	8	18	3	3
	times/year	15	8	8	46	92
	m³/make-up					
	m³/make-up	10	2	16	5	5
	m³/make-up					
						3
	h					3
	kg/yea					500
	Euro/kg					1
Consumption of descaling product #2 (if needed)	kg/year					
Price of descaling product #2	Euro/kg					
Total manpower for the filter press cleaning, bath controls etc.	h/year	460	460	460	136	136
Phosphate sludge volume per year (from filter press or others..)	t/year					
Neutralisation sludge volume per year (only if number is available)	t/year					
Overflow to waste water treatment	m³/h					
The following questions are only for *heated* tanks:						
What is the outside length of the tank?	m	3,6	2,3	6,7		
What is the outside width of the tank?	m	1,5	3	3		
What is the outside depth of the tank?	m	1,9	0,9	0,9		
Is the tank heat isolated? (yes or no)	yes / no	yes	yes	yes		
What is the outside minimum height of the tunnel above the tank?	m	2,6	2,6	2,6		
Is the tunnel above the tank heat isolated? (yes or no)	yes / no	yes	yes	yes		

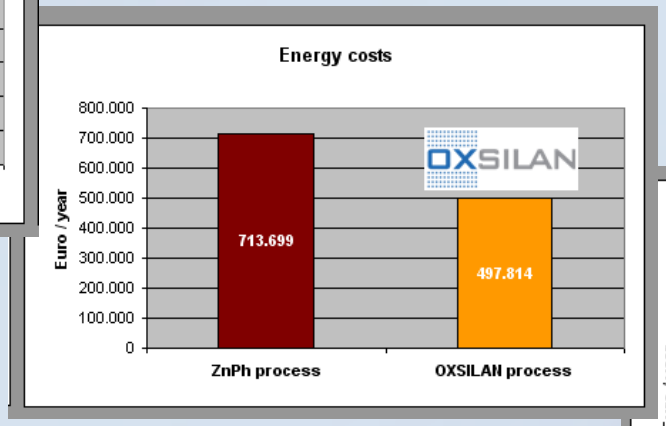
Abstract

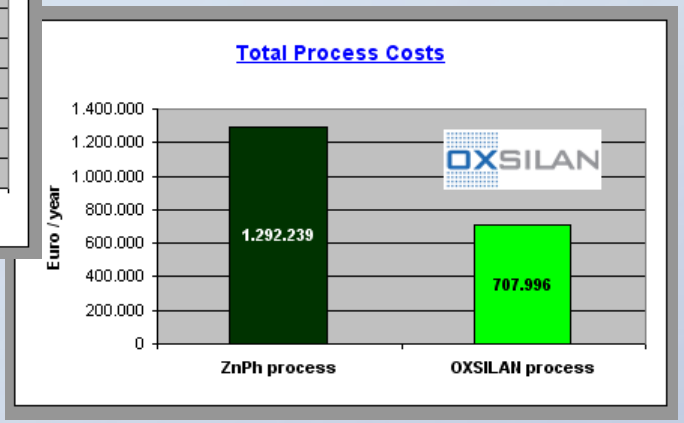
Oxsilan® calculation tool helps you quantify your savings in advance

Oxsilan® Calculation Tool

- Calculation results (example):







Oxsilan® calculation tool helps you quantify your savings in advance

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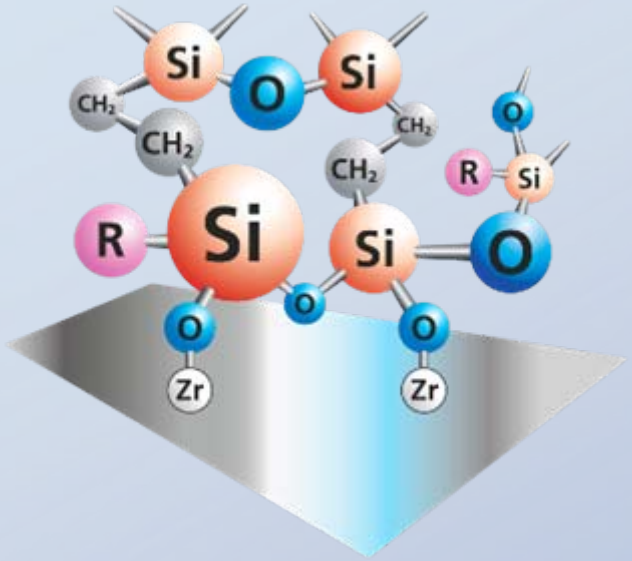


Oxsilan® Case Study: Trailer Chassis

Chemetall

- Steel trailer chassis and Aluminum components: Oxsilan 9810/1 + E-Coat + Powder Coat
- In operation: since June 2008
- Customer: Brüggen Fahrzeugwerk & Service GmbH, Lübtheen, Germany
- Process cost savings: >150.000 Euro p.a.

- Advantages:
  - Lower investment required for new production plant
  - Higher production rate
  - 50% reduction in fresh and waste water by using a cascade rinse system
  - Significant reduction in energy use as no heating required
  - Simple filtration treatment sufficient for waste water
  - Multi-metal process: steel chassis and aluminum profiles are pretreated in the same line

'Cool Liner' Trailer of Fahrzeugwerk Bernard KRONE GmbH

Oxsilan® Case Study: Opel Insignia Axles

- Front and rear axes of Opel Insignia: Oxsilan 9820 + E-Coat
- In operation: since February 2009
- Customer: Adam Opel GmbH, Kaiserslautern, Germany
- Process cost savings: six figure range

Opel Insignia - Car of the year 2009

- Advantages:
  - 30% productivity increases
  - No heating for phosphate stages
  - Intelligent recycling of rinse water
  - No separate waste water treatment required
  - Quality corresponds to ZnPh

Oxsilan® Case Study: Motorbikes

Chemetall

- Motorbikes:
  Oxsilan 9810/2 + Oxsilan Additive 9905
- In operation: since January 2007
- Customer: Yamaha, Barcelona, Spain
- Production: 600 – 700 motorbikes/day
- Process cost savings : 90.000 €/year

- Advantages:
  - Lower investment of new production plant
  - Reduction of residues
  - Less CO_2 emission
  - Improved working conditions
  - Easiest process control

Oxsilan® Case Study: Washing Machine Housing

- Washing machine housing:
  Oxsilan 9810/1 + E-Coat + Powder Coat
- In operation: since January 2008
- Customer: Electrolux, Alcalá de Henares, Spain
- Total process cost savings:
  76.000 €/year → 2,6 € per 100 sqm

- Advantages (per year):
  - Maintenance: No filter press, no acidic cleaning, no maintenance for cleaning nozzles and no sludge removal required (12.000 €)
  - Energy savings: 41.000 € energy savings as no heating necessary and 8.000 € in electricity savings
  - Environmental aspects: reduced water consumption 6.000€, reduced atmospheric emissions, less packaging, reduction in harmful metals, less sludge and fewer residues

Oxsilan® Fallstudie: Ölfiltergehäuse

Chemetall

- Housing for oil filter:
  Oxsilan 10738 + Liquid Coating
- In operation: since April 2008
- Customer: Mann+Hummel, Marklkofen, Germany

- Advantages:
  - Environmental aspects: no phosphate sludge, no hazardous heavy metals, simple waste water treatment
  - Improved quality
  - Energy savings
  - Less maintenance per quarter
  - Simplified process, increased productivity

Oxsilan® Case Study: Car Body

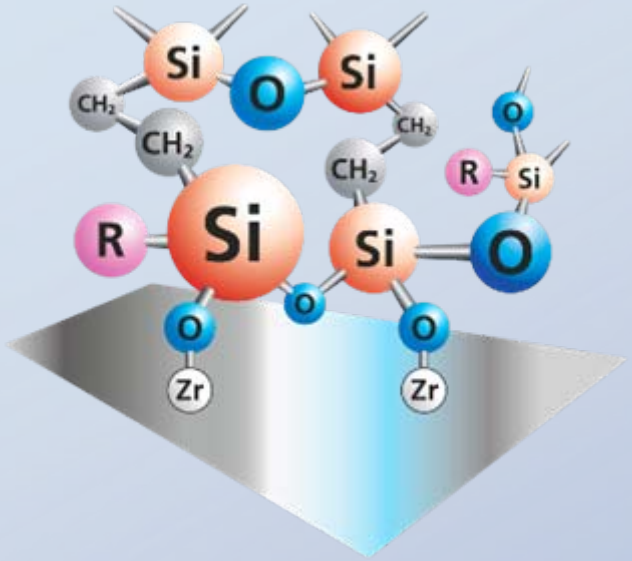
Chemetall

- Car bodies
  Peugeot 407 und Citroën C5
  Oxsilan + E-coat
- In operation: since August 2009
- Customer: PSA, Rennes, France

- Advantages:
  - Less energy costs (heat + pump energy)
  - No phosphate sludge disposal
  - Nickel-free process
  - Simplified process

Agenda

1. The company Chemetall
2. Drivers for new technologies
3. Oxsilan® – The eco-friendly solution for ZnPh replacement
   a) Chemistry
   b) Process comparison: Oxsilan vs. ZnPh
   c) Cost advantages
4. Oxsilan® case studies
5. Summary



Summary

- Chemetall is focused on developments of environmentally-sound and game-changing technologies
- Oxsilan® technology
  - Reduce process costs, increase productivity
  - Comply with increasing environmental aspects
  - Meet high quality standards
- More than 150 customers worldwide confirm product quality
- Oxsilan® - The eco-friendly solution for metal pretreatment

Oxsilan® - Quality, sustainability and profitability all in one

Chemetall

... much more than chemistry.

Thank you very much for your attention!

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