

ZERUST® EXCOR®

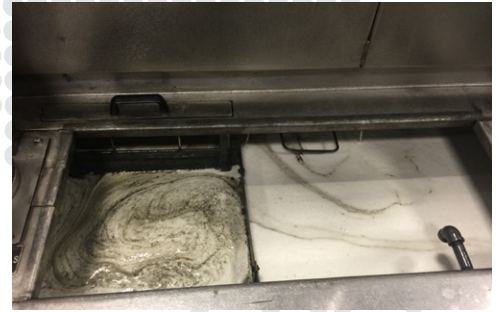
Zerust® Chemical Group



**Zerust® Global Corrosion
Management Solutions**

How Zerust® Works for You

For almost 50 years, beginning with the invention of Vapor Corrosion Inhibiting (VCI) film packaging, Zerust®/Excor® has led the market in quality corrosion solution products. We are dedicated to providing expert corrosion management services and broadening the range of corrosion solutions for our customers. Zerust® users have access to on-site support from Zerust®/Excor® representatives in more than 70 countries. Our customers have peace of mind when they choose Zerust® for corrosion control management.



High-Performance Parts Wash Fluids and Rust Preventative Products

In addition to Zerust® VCI film and other packaging products, Zerust® offers an increasing range of cost-effective, high performance wash fluids and rust preventative products. These products are formulated to work synergistically together to provide enhanced, comprehensive corrosion solutions for our customers. Backed by our global expert technical support and testing services, a comprehensive corrosion management program can be designed and deployed to meet each individual customer's needs.

- Application specific products
- Overall cost reduction
- Reduction of corrosion issues associated with handling, packaging and storage of precision machined, bare metal components
- Enhanced fluid maintenance and control procedures for extending the use life of wash fluids and rust preventative products
- Customer and product specific operating guides
- Zerust® assured corrosion-free results from effectively cleaned and dried parts



Our Commitment to Quality, Safety and the Environment

We are committed to making safe and effective products that reduce industry's impact on the environment. Zerust®/Excor® products are approved by many major companies' toxicology, engineering and packaging departments and comply with health and safety regulations around the globe including the following:



- REACH Regulation Compliant (EC No 1907/2006)
- European RoHS Directive Compliant
- Global Automotive Declarable Substance List (GADSL) Compliant
- Toxic Substances Control Act (TSCA) Chemical Substance Compliant
- Do not contain Substances of Very High Concern (SVHC)
- Labelled in accordance with Globally Harmonized System (GHS) and are compliant under UN GHS, EU CLP, US OSHA HazCom and CA WHMIS

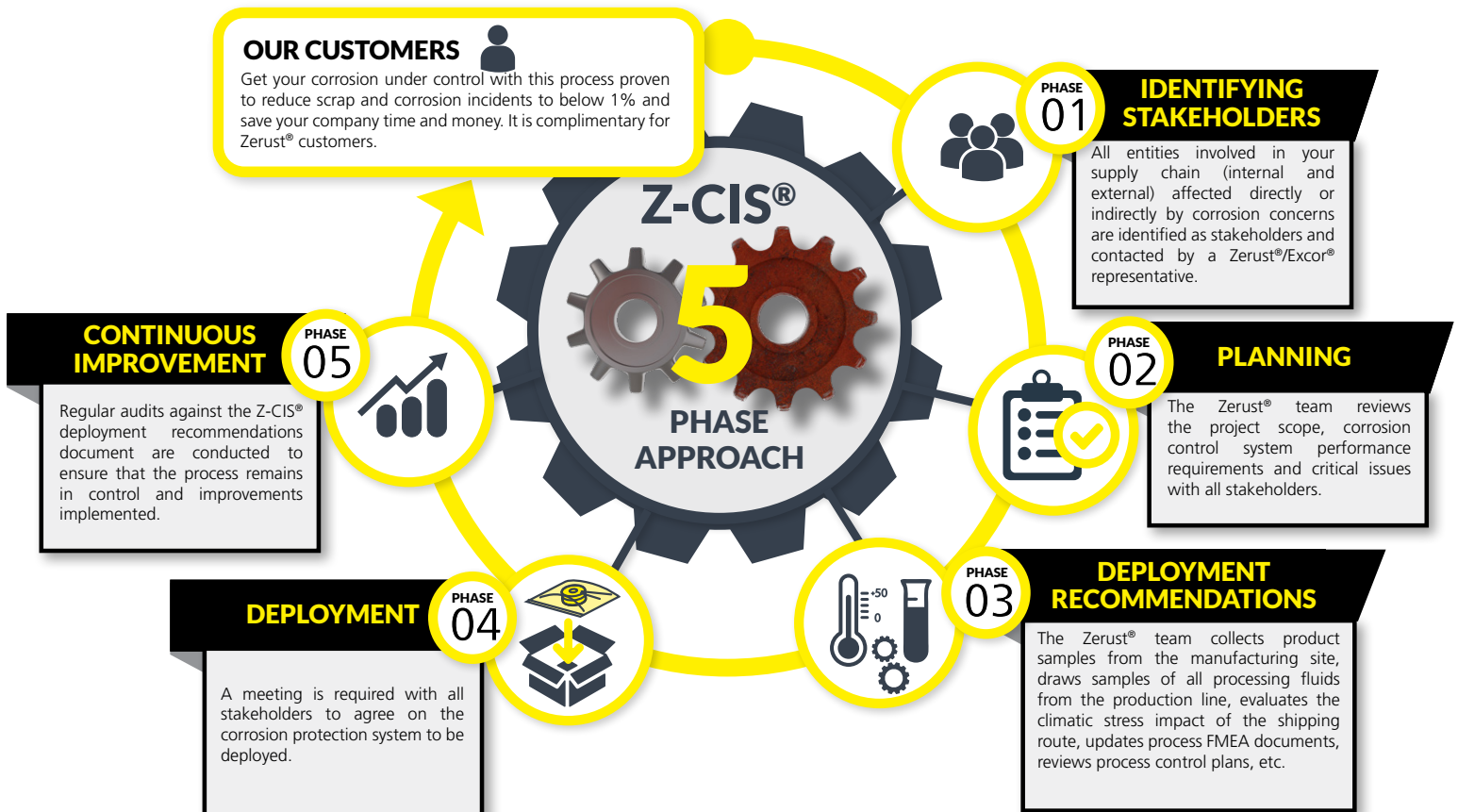
Zerust®/Excor® is a business unit of Northern Technologies International Corporation (NASDAQ:NTIC), Headquartered in Minnesota, USA. The management system of Zerust® products is ISO 9001:2015 certified.

Choosing a Corrosion Management System

Z-CIS® is the Zerust® Corrosion Inhibiting System and the proven methodology for deploying our comprehensive corrosion management solutions. It addresses the causes of corrosion at each stage in manufacturing processes, product handling and in transit around the world. The Z-CIS® method is designed to meet both the rust-free and contaminant-free requirements of various OEMs sourcing from a global supply base. After implementing Z-CIS®, companies generally reduce costs related to corrosion by 10% or more and realize as high as 100% rust-free shipment yields. To get started, visit www.zerust.com/tellus.



Our GC/LC Mass Spectrometry is just one of the tools we use in our lab for testing a customer's process fluids and the effectiveness of recommended corrosion solutions.



Worldwide Technical Support

Our internationally recognized scientists and field engineers work closely with customers to design and implement comprehensive corrosion management systems. Then, Zerust®/Excor® representatives located across the globe provide on-site technical support to ensure the efficacy of these solutions. Our application engineers will assist with the on-site preparation and packaging of test shipments. At its destination, the shipment may be inspected and evaluated by a global Zerust®/Excor® representative.



Lab and Test Facilities Across the Globe

The effectiveness of the proposed corrosion management system can be evaluated under simulated extreme climatic conditions in one of our multiple worldwide regional Zerust®/Excor® technical support centers.



Testing and Services Offered

Performance Testing	
Cyclic Chamber Test	QUV / Accelerated Weathering
Salt Spray Chamber Test	Cast Iron Chip Test
Humidity Chamber Test	Water Drop Test
Hydrogen Sulfide & Sulfur Dioxide Chamber Test	VCI Standard Test
Environmental Chamber	
Chemical Analysis	
Gas-Chromatography Mass-Spectrometry (GC-MS)	Bacteria Testing
Ion-Chromatography	Coulometric Karl Fischer
Liquid-Chromatography Mass-Spectrometry (LC-MS)	TAN & TBN
Fourier Transform Infrared Spectroscopy (FTIR)	
Mechanical Testing	
Mechanical Property Test	Thermal Gravimetric Analysis (TGA)
Differential Scanning Calorimetry (DSC)	
Services	
Data Logger Analysis	Problem Solving, Shipment Inspection Site Visit
Basic Corrosion Prevention Training	

Zerust® Surface Cleaners and Washes

The Zerust® line of advanced surface cleaners remove residual contaminants and soils left by metalworking processes. Use as a final wash step to control corrosion on contaminated or highly reactive metals. After cleaning, thoroughly dry metals before the application of Zerust® corrosion inhibiting coatings and VCI packaging products.



Drop test with tap water on left, panel on right treated with solution of AxxaWash™ NW-10C in tap water

Zerust® Surface Cleaners and Washes

Zerust® Product Name	Metals Treated	Effective Against	Dilution Rate	Application
AxxaWash™ KF series cleaners	Alkaline aqueous wash, for ferrous metals, part washers use.	Light to medium hydrocarbon soils	1-10%	Spray, dip, ultrasonic wash
AxxaWash™ NM series cleaners	Neutral aqueous wash, for multimetal, part washers use.	Chlorides, sulfates, hydrocarbon soils	1-10%	Spray, dip, ultrasonic wash
AxxaWash™ NW-10C	Alkaline aqueous wash for ferrous parts.	Chlorides, sulfates, hydrocarbon soils	1-5%	Spray, dip, vibratory, ultrasonic wash
AxxaWash™ NW-12C	Alkaline aqueous wash for ferrous parts with extended flash corrosion protection.	Chlorides, sulfates, hydrocarbon soils	1-5%	Spray, dip, vibratory, ultrasonic wash



AxxaWash™ Cleaner and Cleaner-Degreaser Series



The AxxaWash™ Cleaner and Cleaner-Degreaser series consist of low foaming* aqueous cleaner and cleaner-degreaser products that are specifically designed to quickly and effectively remove light to medium hydrocarbon soils typically encountered in metalworking and metal finishing operations. This series will include alkaline, and neutral pH products uniquely formulated to suit customer and part-specific requirements based on alloy type, soil type, methods and parameters of application as well as cleanliness levels and corrosion inhibition requirements.

* Foaming propensity and degree of foaming is dependent on a number of factors such as temperature, surfactant type, spray application pressure, air entrainment and type of soil/contaminant.

Zerust® Rust Preventative Additives and Water Conditioners



Zerust® Rust Preventative Additives and Water Conditioners

Zerust® Product Name	Typical Application	Format	Incompatible Metals	Addition Rate
Rust Preventative Liquid Additives				
Axxatec™ 8110C	Closed system rust preventative additive	Liquid concentrate	None	10%
Water-Soluble Additives				
AxxaVis™ PX-05-AN	Acid Neutralizer	Water-soluble powder	Limit contact with aluminum and zinc	1-10%
AxxaVis™ PX-10-HRD	Hard Water Conditioner	Water-soluble powder	None	0.04-10%
AxxaVis™ HST-10	Hydrostatic Testing	Water-soluble powder	Zinc, limit contact with aluminum. The addition of Axxatec™ CC-100 is required when processing red/yellow metals.	0.5-5%

AxxaVis™ Rust Preventative Additive and Water Conditioner Series



The Zerust®/Excor® Axxavis™ series consists of high-performance water-soluble powder additives that were developed to help you achieve rust-free results by conditioning hard water, neutralizing acid and deactivating ionic contaminants. AxxaVis™ series is designed to provide a safe, convenient to use, and environmentally friendly product line for use in a number of targeted applications.

- Precision machined metal
- Ferrous metal components
- Stampings
- Forgings
- Powdered metal
- Gray iron
- Clean dry components ready

Axxatec™ Aqueous Based Rust Preventative Series



The Zerust®/Excor® Axxatec™ series consists of aqueous based rust preventative products that are specifically designed to protect ferrous, non-ferrous and multimetal metal assets. Use Axxatec™ products to protect bare metal surfaces during assembly, and in situations where water-based spray-on, in-line production or dipping applications are desired. Axxatec™ products offer an easy-to-use corrosion inhibiting additive that forms a clear, thin, dry-to-touch coating that helps prevent flash rust in-between production processes and for short to medium term shipment and storage periods in conjunction with Zerust VCI packaging. Check with your Zerust®/Excor® representative for a corrosion management system most effective for your metal assets.

Zerust® Rust Preventative Coatings

Zerust® Rust Preventative Coatings



Zerust® Product Name	Protected/Compatible Metals					Outdoor Protection Life (Up To)	Indoor Protection Life (Up To)*	Designed for Use with Packaging	Application Method			Formulation Base	Surface Finish
	Ferrous	Aluminum	Brass	Zinc	Copper				Spray/Fog	Brush	Dip		
Water-Based Coatings													
Axxatec™ 77C (4% dilution)	✓	✓	✓		✓	Not recommended	4 months	Yes	✓	✓	✓	Water-based	Thin, cloudy, visible
Axxatec™ 80C (7.5% dilution)	✓					Not recommended	12 months	Yes	✓	✓	✓	Water-based	Clear, dry to touch
Water-Based VCI													
Axxatec™ 85-F	✓					Not recommended	12 months (in enclosure)	Yes	✓			Water-based with VCI	Clear, dry to touch
Axxatec™ 87-M	✓		✓		✓	Not recommended	12 months (in enclosure)	Yes	✓			Water-based with VCI	Clear, dry to touch
Solvent-Based Coatings													
Axxanol™ 33CD	✓	✓	✓	✓	✓	Not recommended	6 months	Yes	✓	✓	✓	Solvent-based	Dry to touch
Axxanol™ 34CD	✓	✓	✓	✓	✓	Not recommended	6 months	Yes	✓	✓	✓	Solvent-based	Very thin oil
Axxanol™ A35CD-32	✓	✓	✓	✓	✓	Not recommended	12 months	Yes	✓	✓	✓	Solvent-based	Near Dry to touch
Oil-Based Coatings													
Axxanol™ 33	✓	✓	✓	✓	✓	Not recommended	12 months	Yes	✓	✓	✓	Oil-based	Thin oil
Axxanol™ 750-NV	✓	✓	✓	✓	✓	Not recommended	24 months	Yes	✓	✓	✓	Oil-based	Thin oil
Axxanol™ 46-BIO	✓	✓	✓		✓	Not recommended	12 months	No	✓	✓	✓	Bio-based oil	Thin oil
VCI Oil Coatings													
Axxanol™ 750	✓	✓	✓	✓	✓	Not recommended	10 months	Yes	✓			Oil-based with VCI	Thin oil

* Indoor protection life rated for items stored indoors or under shelter in temps less than 100°F/38°C and in less than 70% relative humidity. Check with your Zerust® representative for details on Zerust® packaging products that extend protection life up to five years and beyond. Water-based product test results are per ASTM D2247 humidity chamber testing. Oil- and solvent-based product test results are per ASTM B117 salt spray testing.

Axxanol™ Rust Preventative Coating Series



Zerust®/Excor® Axxanol™ series contains oil-based, bio-based and solvent-based rust preventative coatings that leave a dry-to-touch to an oily protective film after being applied. Use Axxanol™ products for extreme corrosion protection during storage, shipment and work-in-progress. Check with your Zerust®/Excor® representative for the most effective Axxanol™ product to protect your metal assets.



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