How Zerust® Works for You

For over 35 years, beginning with the invention of 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 onsite 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 Rust Removers and Corrosion Inhibitor Additives and Liquids

In addition to Zerust VCI (Vapor Corrosion Inhibiting) film and other packaging products, Zerust offers an increasing range of cost-effective rust preventatives (RPs), VCI oils, corrosion inhibiting additives and rust removers. These products are formulated to work together to provide comprehensive corrosion solutions for our customers. Backed by our expert technical support and global testing services, a complete corrosion management program can be designed to meet each customer's needs.

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
- Do not contain SVHC (Substances of Very High Concern)
- Labelled in accordance with GHS (Globally Harmonized System) and are compliant under UN GHS, EU CLP, US OSHA HazCom and CA WHMIS

Zerust 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.

Humidity chambers are used for testing, such as evaluating a customer’s process fluids and the effectiveness of recommended corrosion solutions.

Zerust Vapor Corrosion Inhibitors (VCIs) and Related Rust Removers and Coatings

Zerust is the inventor of VCI polyethylene packaging and a global leader in corrosion management. We continue to apply our knowledge of corrosion to meet customer needs with innovative solutions and services that add value to Zerust VCI packaging. Check with your Zerust representative to find the product that is right for your application.

Illustration of VCI molecules enclosed in a Zerust VCI bag.

How VCI Works

VCI molecules inhibit corrosion by preventing moisture and environmental elements from reacting with the metal surface. Since VCI molecules are transported through the air, they must be trapped around the metal surface using a poly bag or other enclosure. When metals are contaminated, in highly corrosive environments, or stored for long periods of time, use of a VCI packaging product and a corrosion inhibitor coating can provide comprehensive protection.

On left: competitor VCI oil protection; on right: Zerust Axxanol™ 750 VCI Oil. Results after 24 hours in ASTM B117 salt-spray testing.
Zerust® AxxaClean™ rust and tarnish removers are powerful solutions for the rework and recovery of metal items. Zerust offers a range of technologies, from pH neutral products to more aggressive products that also inhibit flash corrosion on cleaned surfaces.

Zerust AxxaClean Rust and Tarnish Remover Series

<table>
<thead>
<tr>
<th>Attributes</th>
<th>AxxaClean ICT620-RR</th>
<th>AxxaClean 2048</th>
<th>AxxaClean 3048</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion Removal Power</td>
<td>Light to medium rust, even in cracks and crevices</td>
<td>Medium corrosion, even in cracks and crevices</td>
<td>Heavy corrosion, even in cracks and crevices</td>
</tr>
<tr>
<td>Speed</td>
<td>Slow</td>
<td>Moderate</td>
<td>Rapid</td>
</tr>
<tr>
<td>Metals Treated</td>
<td>Ferrous</td>
<td>Ferrous, brass, copper</td>
<td>Ferrous, brass, copper</td>
</tr>
<tr>
<td>Application Methods</td>
<td>Immersion</td>
<td>Immersion, brush-on, spray</td>
<td>Immersion, brush-on</td>
</tr>
<tr>
<td>pH Level</td>
<td>Neutral pH of about 7</td>
<td>Mild acidic pH of about 2.5</td>
<td>Stronger acidic pH between 0.5-1.5</td>
</tr>
<tr>
<td>Temperature For Use</td>
<td>70°F (21°C) or above</td>
<td>70°F (21°C) or above</td>
<td>40°F (4°C) or above</td>
</tr>
<tr>
<td>Compatibility (&lt;24 hour soak)</td>
<td>Safe for metals*, paint, gaskets, rubber, plastics</td>
<td>Safe for metals*, paint, gaskets, rubber, plastics</td>
<td>May attack soft metals*, some paints and coatings</td>
</tr>
<tr>
<td>Post-Cleaning Action</td>
<td>Do not let product dry on surface. Recommended DI or RO water rinse. Wipe off and dry well.</td>
<td>Do not let product dry on surface. Recommended DI or RO water rinse. Wipe off and dry well.</td>
<td>Do not let product dry on surface. Recommended DI or RO water rinse. Wipe off and dry well.</td>
</tr>
<tr>
<td>Corrosion Protection</td>
<td>Additional corrosion protection needed</td>
<td>Provides flash-corrosion protection in controlled environments</td>
<td>Provides flash-corrosion protection in controlled environments</td>
</tr>
</tbody>
</table>

*Test before use on zinc and cadmium. Check with your Zerust technical representative for details.

AxxaClean™ ICT®620-RR: Light to Medium Rust Remover

Zerust 620-RR is a pH neutral immersion dip that removes rust, even in crevices, pits and threads. It replaces labor-intensive abrasive cleaning that may damage surfaces. The product works by breaking the chemical bond of rust and does not harm other metals or non-metals. Surfaces may be darkened with carbon residue after cleaning. Cleaned parts must be protected to prevent flash rusting.

AxxaClean 2048 and 3048: Light to Heavy Rust and Tarnish Removers

These are a series of easy to use products that rapidly remove rust and tarnish, even in cracks and crevices. They clean and deoxidize ferrous metals, brass, copper and various alloys without leaving a gray residue. The products also provide temporary protection from flash rust or re-tarnishing for several days in a controlled environment. Multiple viscosities and strengths are available for a wide range of applications.
Zerust® ICT®600 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.

AxxaClean HPW-100C Non-Foaming, Demulsifying Cleaner

AxxaClean HPW-100C high-pressure wash additive prevents flash corrosion after cleaning processes by providing powerful deactivation of ionic contaminants, such as highly corrosive chlorides and sulfates on metal surfaces. It is non-foaming and can be applied by immersion, high-pressure or ultra high-pressure wash.

AxxaWash NW-10C Cleaner and Emulsifying Degreaser

AxxaWash NW-10C wash additive deactivates corrosion causing ionic contaminants such as chlorides left by metalworking fluids. It also degreases and removes hydrocarbon soils. It can be applied by immersion, high-pressure or ultra high-pressure wash. AxxaWash NW-10 is recommended for use on highly reactive ferrous metals such as cast iron exposed to inorganic salts and other contaminants.
A range of high-performance rust preventative liquids and powder additives are offered by Zerust®/Excor®. These additives were developed to help you achieve rust-free results in a number of targeted applications.

Zerust Rust Preventative Additives and Water Conditioners

<table>
<thead>
<tr>
<th>Zerust Product Name</th>
<th>Typical Application</th>
<th>Format</th>
<th>Incompatible Metals</th>
<th>Addition Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rust Preventative Liquid Additives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axxatec™ 8110C</td>
<td>Closed system rust preventative additive</td>
<td>Liquid concentrate</td>
<td>None</td>
<td>10%</td>
</tr>
<tr>
<td>Axxanol 707C</td>
<td>Void space protection VCI additive</td>
<td>Liquid concentrate with VCI</td>
<td>None</td>
<td>.05-2%</td>
</tr>
<tr>
<td>Axxanol 710C</td>
<td>VCI Oil additive</td>
<td>Oil additive with VCI</td>
<td>None</td>
<td>.3-10%</td>
</tr>
<tr>
<td><strong>Water-Soluble Additives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AxxaVis™ PX-05-AN</td>
<td>Acid Neutralizer</td>
<td>Water-soluble powder</td>
<td>Limit contact with aluminum</td>
<td>1-10%</td>
</tr>
<tr>
<td>AxxaVis PX-10-HRD</td>
<td>Hard Water Conditioner</td>
<td>Water-soluble powder</td>
<td>None</td>
<td>0.04-10%</td>
</tr>
<tr>
<td>AxxaVis HST-10</td>
<td>Closed system rust preventative additive</td>
<td>Water-soluble powder</td>
<td>Zinc, limit contact with copper</td>
<td>0.5-5%</td>
</tr>
</tbody>
</table>

Zerust® ICT®700 Rust Preventative Additives

Product Series Highlights

**Axxatec 8110C** is an aqueous-based additive for the protection of water-filled void spaces of hydraulic and coolant equipment.

**Axxanol 700 Series** are liquid concentrates with VCl's for adding to oils to protect void spaces.

**AxxaVis PX-05-AN** is a powder, that when added to rinse water, enables it to neutralize acids. Use to control flash corrosion on metals caused by acids left over from cleaning and rust removal treatments as Zerust AxxaClean™.

**AxxaVis PX-10-HRD** is a powder additive that conditions hard water to prevent scale and scum when deionized water is not available. It increases the performance of Zerust products that require dilution, such as Axxatec and AxxaWash™ concentrates.

**AxxaVis HST-10** is a powder additive to treat hard water and deactivate chlorides. Add product to tap water to make it suitable for hydrostatic test processes conducted on pressure vessels such as pipes, heat exchangers, storage tanks and ship voids.
Zerust® offers a full line of corrosion inhibitor liquids that complement our VCI packaging solutions. Zerust RPs and coatings range from effective aqueous-based solutions to greases designed to give standalone protection.

### Zerust Rust Preventatives and Coatings

<table>
<thead>
<tr>
<th>Metals Protected</th>
<th>Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor Protection Life (Up To)</td>
<td>Indoor Protection Life (Up To)*</td>
</tr>
</tbody>
</table>

#### Water-Based Coatings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ferrous</th>
<th>Aluminum</th>
<th>Brass</th>
<th>Zinc</th>
<th>Copper</th>
<th>Not recommended</th>
<th>Life (Up To)</th>
<th>Method</th>
<th>Surface Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxatec™ 77C (4% dilution)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>4 months</td>
<td>Yes</td>
<td>Water-based, thin, cloudy, visible</td>
</tr>
<tr>
<td>Axxatec 80C (7.5% dilution)</td>
<td>✓</td>
<td>Not recommended</td>
<td>12 months</td>
<td>Yes</td>
<td>✓</td>
<td>✓</td>
<td>Water-based, clear, dry to touch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axxatec 85-F</td>
<td>✓</td>
<td>Not recommended</td>
<td>12 months</td>
<td>Yes</td>
<td>✓</td>
<td>Water-based with VCI, clear, dry to touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axxatec 87-M</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>12 months</td>
<td>Yes</td>
<td>Water-based with VCI, clear, dry to touch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Solvent-Based Coatings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ferrous</th>
<th>Aluminum</th>
<th>Brass</th>
<th>Zinc</th>
<th>Copper</th>
<th>Not recommended</th>
<th>Life (Up To)</th>
<th>Method</th>
<th>Surface Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxanol™ 33CD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>6 months</td>
<td>Yes</td>
<td>Solvent-based, dry to touch</td>
</tr>
<tr>
<td>Axxanol 34CD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>6 months</td>
<td>Yes</td>
<td>Solvent-based, very thin oil</td>
</tr>
</tbody>
</table>

#### Oil-Based Coatings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ferrous</th>
<th>Aluminum</th>
<th>Brass</th>
<th>Zinc</th>
<th>Copper</th>
<th>Not recommended</th>
<th>Life (Up To)</th>
<th>Method</th>
<th>Surface Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxanol 33</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>12 months</td>
<td>Yes</td>
<td>Oil-based, thin oil</td>
</tr>
<tr>
<td>Axxanol 46-BIO</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>3 months</td>
<td>12 months</td>
<td>No</td>
<td>Bio-based oil, thin oil</td>
</tr>
</tbody>
</table>

#### Greases

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ferrous</th>
<th>Aluminum</th>
<th>Brass</th>
<th>Zinc</th>
<th>Copper</th>
<th>Not recommended</th>
<th>Life (Up To)</th>
<th>Method</th>
<th>Surface Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxanol Spray-G</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>12 months</td>
<td>24 months</td>
<td>Yes</td>
<td>Oil-based with solvents, thin oily grease</td>
</tr>
<tr>
<td>Axxanol Z-Maxx LV</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>12 months</td>
<td>24 months</td>
<td>Yes</td>
<td>Oil-based, light grease (NLGI 0)</td>
</tr>
<tr>
<td>Axxanol Z-Maxx</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>12 months</td>
<td>24 months</td>
<td>Yes</td>
<td>Oil-based, thick grease (NLGI 2)</td>
</tr>
</tbody>
</table>

#### VCI Oil Coatings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Ferrous</th>
<th>Aluminum</th>
<th>Brass</th>
<th>Zinc</th>
<th>Copper</th>
<th>Not recommended</th>
<th>Life (Up To)</th>
<th>Method</th>
<th>Surface Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axxanol 750</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Not recommended</td>
<td>10 months</td>
<td>Yes</td>
<td>Oil-based with VCI, thin oil</td>
</tr>
</tbody>
</table>

* 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.

** These plus signs help identify products with positive safety and/or environmental properties. See brochure page 8 for full description.
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