

Do You Have A
Corrosion Problem?

ZERUST[®]  **EXCOR[®]**

corrosion management experts>>>



If you have a corrosion problem, Zerust® has the solution. By using our proprietary Zerust® products and proven Z-CIS® methodology, you can achieve these benefits:

- Consistent, worry-free and rust-free results during storage and shipment to end-users.

If you have a corrosion problem,
we have the solution.

- Significant monetary savings due to reduced customer rejects, rework and scrap.
- Overall quality improvements in your manufacturing processes and supply network.



Northern Technologies International Corporation (NTIC) has over 30 years of onsite corrosion problem-solving experience in over 60 countries. By using our proven corrosion-solving methodology, the Zerust® Corrosion Inhibiting System or “Z-CIS®” method, NTIC can help dramatically reduce if not eliminate your cost of corrosion.

We can solve your corrosion problems with our proven approach.

NTIC has helped over 5,000 customers reduce their corrosion problems related to export shipments, storage and operations. Several large manufacturing companies have saved over \$2M USD each year by fully deploying and maintaining Z-CIS® at their manufacturing sites and supply networks.

How much is corrosion really costing you?

Please complete as much of the worksheet below as possible in order to help estimate your **REAL** cost of corrosion.

Or visit www.zerust.com/rustcosts for an easy-to-use interactive tool.

Description	Code	Your Estimate	Comment
Number of products shipped per year	A		Units
Average cost of producing each product	B		Currency
Percentage of products rejected by shipment receiver due to corrosion or related quality failures	C		(%)
Percentage of rejected products unable to be salvage and must be scrapped	D		(%)
Cost of reworking each product	E		Some companies have found this to be more than 30% of the product cost when all the direct costs are taken into consideration.
Direct cost of corrosion per year (subtotal)	F		$F = (A \times B \times C \times D) + [A \times C \times (1-D) \times E]$
Indirect cost of corrosion per year, maintenance of additional inventory, lost freight, warehousing, repacking and handling, production halts, air freight charges, personnel, etc.	G		Some companies have found this to be more than 15% of the direct cost of corrosion calculated above. $G = F \times 0.15$
Your total direct and indirect cost of corrosion PER YEAR	H		$H = F + G$
Your total direct and indirect cost of corrosion PER DAY	I		$I = H \div 255$

NTIC, through our Z-CIS® corrosion-solving methodology and products, can help you reduce your total cost of corrosion by 10% or more.

Have you experienced corrosion or corrosion-related problems?



Shipment Rejections:

Product shipped overseas arrives at the customer rusted, resulting in the shipment being rejected.

.....



Production Delays:

Production tools left in inventory rust beyond a usable state by the time they are needed.

.....



Equipment Failures:

Electrical control panels and electronic equipment stop functioning.

.....



Costly Repairs and Production Downtime:

Structural failures affect production and product quality, resulting in costly repairs or replacements.

.....



Health and Environmental Concerns:

Inefficient corrosion protection methods are expensive to remove, are difficult to dispose of, and contaminate the workplace and the environment.

.....



Costly Rework:

Any additional rust removal and parts rework can add significant costs.



Z-CIS[®]: Our proven unique methodology for solving your corrosion problems.

The Zerust[®] Corrosion Inhibiting System (Z-CIS[®]) is the proven methodology for deploying the complex corrosion management systems necessary to ensure the protection of metal products. It addresses causes of corrosion at each stage of product handling, in production and in transit around the world, as the product travels among multiple internal and external stakeholders. Z-CIS[®] is proven to meet both the rust-free and contaminant-free requirements of various OEMs sourcing from a global supply base. After implementing Z-CIS[®], our clients generally realize total cost savings of at least 10% and rust-free shipment yields as high as 100%.

To get started visit www.zerust.com/tellus



Z-CIS® Five-Phase Approach

PHASE

1

Identifying Stakeholders

- All entities involved in your supply chain (internal and external) affected directly or indirectly by corrosion concerns are identified as stakeholders and contacted by a Zerust® Representative.
- Each entity completes a **Z-CIS® Questionnaire** (www.zerust.com/tellus) either independently or in the course of a phone interview, so the Zerust® Corrosion Engineering Team can properly understand all potential root causes of corrosion at the start of the project.

PHASE

2

Planning

- The Zerust® Team reviews the project scope, corrosion control system performance requirements and critical issues with all stakeholders.
- The **Z-CIS® Deployment Proposal** is distributed. This document outlines the work that the Zerust® Team would need to perform, the cost associated with the project, our initial recommendations and any additional items/information required from the stakeholders.
- Key stakeholders review and sign-off on the Z-CIS® Deployment Proposal, authorizing the Zerust® Team to start work.

PHASE

3

Deployment Recommendations

- The Zerust® Team collects product samples from the manufacturing site, draws samples of all processing fluids from the production line, evaluates the climatic stress impact of the shipping route, updates process FMEA documents, reviews process control plans, etc.
- Products and fluid samples are tested in one of our regional laboratories located around the world for corrosion management system compatibility.
- The Zerust® Team recommends a corrosion protection system (several recommendations may be generated) in the **Z-CIS® Deployment Recommendations** document.

PHASE

4

Deployment

- A meeting is required with all stakeholders to agree on the corrosion protection system to be deployed.
- The Zerust® Team works with the organizations directly involved in the process change (if any) to deploy the recommended solution. The corrosion protection system is executed in a viable time frame.
- Trial shipments are made and monitored to ensure that the new Z-CIS® Plan is working properly.

PHASE

5

Continuous Improvement

- Regular audits are conducted to ensure that the process remains in control and improvements are implemented according to the **Z-CIS® Deployment Recommendations**.

What is Integrated Corrosion Technologies (ICT®)?

Zerust® Integrated Corrosion Technologies (ICT®) is our term for the various materials and chemical sciences that comprise our products. Depending on corrosion protection requirements and economic targets, the following combinations of ICT® Products can be designed to create the optimum corrosion protection system.

Physical material design and selection. The Zerust® Team will help you select the optimal packaging material and design to meet your corrosion protection needs. The material may vary from barrier film, to a low density polyethylene, depending on economic targets and performance requirements.

Chemical scavenging technology. Depending on the corrosivity of the environment, the Zerust® Team may also incorporate our patented chemical scavenging technology into the selected base packaging material to neutralize any acid gases and prevent them from coming in contact with metal components sealed inside the package.

Chemical passivation technology. This technology is generically referred to in the industry as volatile or vapor corrosion inhibiting (VCI) technology. Zerust® chemical passivation technologies are proprietary formulations that are based on non-toxic food additives. They only activate in direct response to the corrosivity of the immediate environment. The Zerust® chemical molecules are deposited from the Zerust® corrosion products onto metal surfaces and form a powerful molecular layer that passivates these metal surfaces and protects them from corrosion. This layer is invisible and dry, and does not affect the physical properties or functionality of the metal in any way. The protected metal can be painted, treated and/or used straight out of the Zerust® Package without further cleaning.

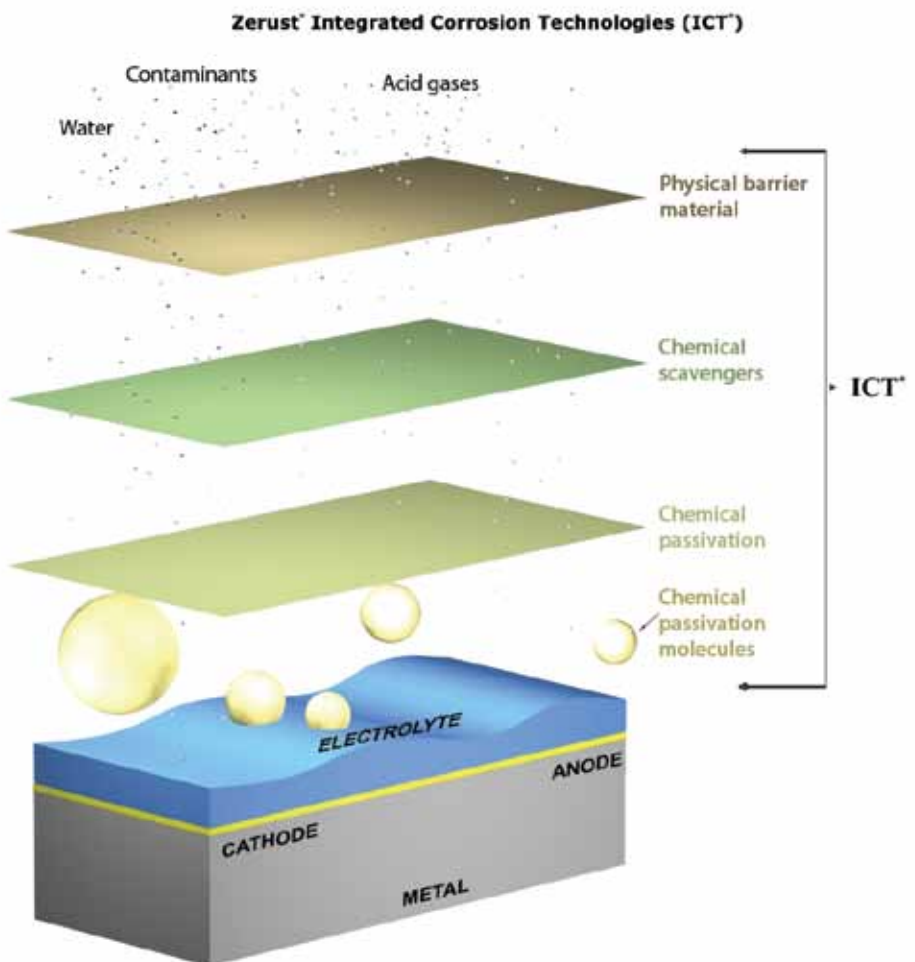
The total solution. We offer comprehensive solutions for your entire supply chain and manufacturing process that help you achieve your corrosion protection objectives and cost targets. Additional examples of Integrated Corrosion Technologies® include void protection diffusers, rust preventative coatings and hard-working rust removers. These solutions are tested to work together for total corrosion control.

Total Corrosion Control.

How does ICT[®] work?

Zerust[®] ICT[®] prevent corrosion in several ways.

1. By acting as a protective barrier from external dirt and abrasion, and also as a barrier to help block the diffusion of corrosive acid gas pollutants from outside and inside the ICT[®] packaging (such as sulfur dioxide or hydrogen sulfide)—thereby preventing contact between these corrosive gases and the enclosed metal surfaces.
2. By emitting vapor corrosion inhibitors that passivate the electron flow between the anodic and cathodic areas on metal surfaces and interrupt the electro-chemical corrosion process.
3. By depositing a hydrophobic molecular layer and thereby inhibiting water from reaching the metal surfaces and forming the electrolyte necessary for corrosion reactions.

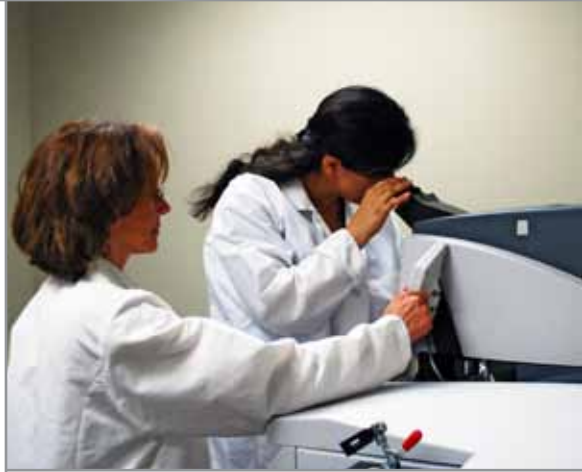


Laboratory testing and analysis.



With the aid of our team of specialists from one or more of our eight analysis and research laboratories worldwide and network of external independent testing centers, NTIC is able to identify the source and species of corrosive elements causing your corrosion problem. This allows for faster testing turnaround times and accurate analysis of results.

Make sense of test data. General purpose laboratories can analyze components and process fluid specimens, but they lack the experience garnered by decades of work focused on accurately translating test results into actionable initiatives that will aid to resolve corrosion problems.



Corrosion control management services.

Outsource your corrosion concerns to us. NTIC is able to help you establish the most efficient and economic corrosion control system for you and your supply chain. NTIC is also able to manage the corrosion control system to ensure compliance and a consistent outcome.














Global onsite technical service support.

NTIC has technical representation in over 60 countries. This ensures that when you encounter rust problems that require immediate attention, NTIC technical personnel are able to review the problems onsite. Alternatively, we can act as your agents in locations where you do not have direct representation and report to you on situations as necessary. With this global support, NTIC resolves your rust problems quickly and can deliver accurate independent data collection virtually anywhere in the world.



-  Algeria
-  Argentina
-  Australia
-  Austria
-  Bangladesh
-  Belarus
-  Belgium
-  Bhutan
-  Brazil
-  Canada
-  Chile
-  China
-  Czech Republic
-  Denmark
-  Estonia
-  Finland
-  France
-  Germany
-  Hungary
-  India

-  Indonesia
-  Ireland
-  Italy
-  Japan
-  Kazakhstan
-  Korea
-  Latvia
-  Libya
-  Lithuania
-  Luxembourg
-  Malaysia
-  Mexico
-  Monaco
-  Morocco
-  Nepal
-  Netherlands
-  Nigeria
-  Norway
-  Philippines
-  Poland

-  Portugal
-  Romania
-  Russia
-  Singapore
-  Slovak Republic
-  Slovenia
-  South Africa
-  Spain
-  Sri Lanka
-  Sweden
-  Switzerland
-  Taiwan
-  Thailand
-  Tunisia
-  Turkey
-  Ukraine
-  UAE and MENA
-  United Kingdom
-  United States
-  Vietnam
-  Other Countries

Global account management support.

NTIC Account Managers are experienced individuals who work across multiple countries to ensure that your supply chain, shipments and product movements are performing effectively in accordance to the deployed Z-CIS® Plans. These Account Managers will supervise the Z-CIS® Deployment Projects from start to finish. This ensures all organizations and people work together seamlessly to produce the desired results in corrosion control management. This lets you relax and focus on your priorities while leaving the deployment of an effective corrosion control management system to NTIC.

Some corrosion control roles that the NTIC Account Manager may perform are:

- Corrosion incident investigations
- Shipment inspections
- Pack design reviews
- Production part approval process
- Problem-solving team participation
- Work instruction review and/or documentation
- Operator training
- Z-CIS® Deployment Project Management throughout your supply chain
- Zerust® Product Supply Management



Customized solutions.

If you have a unique corrosion challenge—NTIC can develop custom products and services to fit your needs. NTIC's eight laboratories worldwide, global network of experts, and relationships with key universities will bring you a step closer to the ideal product or technology.

The Zerust® Product Line

ICT®400 Series: VCI Kraft Packaging Paper

Acid-free, pH neutral corrosion inhibiting paper and poly-laminated paper offer short-term corrosion protection for metal parts.

Products Include:

ICT®420-35 Acid-Free VCI Kraft Paper

ICT®420-35P VCI Kraft Poly Paper



Zerust® polyethylene films and most Zerust® paper products are recyclable. Please consult local, state and federal regulations.



ICT®500 Series: Packaging Films

Our most widely used series of products. A variety of films offer short or long-term corrosion protection for parts and equipment during storage or shipment.

Products Include:

Zerust® ICT®504-LM Advanced Film

Zerust® ICT®510-C Ferrous Film

Zerust® ICT®510-C Non-Ferrous Film

Zerust® ICT®510-C Multimetal Film

Zerust® ICT®510-CLHD Lightweight Film

Zerust® ICT®510-SRK Shrink Film

Zerust® ICT®510-SK Skin Film

Zerust® ICT®510-SM Machine Grade Stretch Film

Zerust® ICT®510-M22019 Military Qualified Film

Zerust® ICT®520-CB1 Anti-tarnish Film

Zerust® ICT®520-CSL Cold Seal Film

Zerust® ICT®520-HS High-Strength Film

Zerust® ICT®520-XF Ultra Tear-Resistant Film

Zerust® ICT® Closed Cell VCI Foam

Zerust® ICT® Weapon Protection Bags

Zerust® ICT® with Biodegradable Materials



Zerust® polyethylene films and most Zerust® paper products are recyclable. Please consult local, state and federal regulations.



ICT®600 Series: Rust Removers

Highly effective for light to severe rust removal. All ICT®600 Series Cleaners are non-toxic, non-hazardous and non-corrosive.

Products Include:

Zerust® ICT®620-RR Rust Remover Dip pH Neutral
Zerust® Axxaclean™ 2048 Medium Rust Remover
Zerust® Axxaclean™ 3048 Heavy Rust Remover



ICT®700 Series: Liquid Additives and Coatings

Temporary corrosion protection for parts in-between production processes or in storage, as well as for added protection to the ICT®500 Packaging Products during ocean shipments.

Products Include:

Zerust® Axxanol™ 33 Oil-Based Coating
Zerust® Axxanol™ 33CD Oil-Based, Dry-to-Touch Coating
Zerust® Axxanol™ 34CD Solvent-Based, Thin Oil Coating
Zerust® Axxanol™ 750-W VCI Oil
Zerust® Axxanol™ 8110 Water-Based Additive
Zerust® Axxatec™ 77C Water-Based Concentrate
Zerust® Z-Maxx Heavy-Duty Rust Preventative Grease
Zerust® 46-BIO Biobased Preservative Coating



ICT®800 Series: VCI Diffusers

Self-contained, portable products that diffuse Zerust® ICT® protective vapors. The vapors saturate enclosures, such as shipping containers and electrical boxes, to protect metals from corrosion.

Products Include:

Zerust® ICT® Vapor Capsules
Zerust® ICT® Plastabs®
Zerust® ICT® Cor-Tab®
Zerust® ICT® Pipe Strip
Zerust® ICT® Tube Strip
Zerust® ICT® ActivPak™ Flash-Corrosion Inhibitor



Products are subject to change and availability

To find out more about Zerust® Products that are right for your application, please visit www.zerust.com/product

Solutions for every application.

With our wide range of Zerust® Products, NTIC augments Z-CIS® Deployment Services to achieve the optimum corrosion management systems for your manufacturing sites and supply network. This provides consistency and control in the deployed corrosion management system—we control the tools (Zerust® Products) to ensure a positive outcome.



Zerust® has decades of experience protecting parts and equipment as they are transported around the world: with outstanding results. Upon implementing our solutions, our clients have achieved up to 100% rust-free shipments.

Some products used for Export Shipment applications include:
Zerust® ICT®510-C Film • Zerust® ICT®520-XF Film
Zerust® Axxanol™ 33CD Coating • Zerust® Axxanol™ 750-W VCI Oil RP



Parts and equipment that need to be stored for long periods have their own challenges, especially when climate control is not possible. Relax. With Zerust®, we help ensure that parts stay corrosion-free for the duration of their storage time.

Some products used for Long-Term Storage applications include:
Zerust® ICT®510-M22019 Film • Zerust® ICT®520-HS Film
Zerust® Z-Maxx Coating



Don't risk valuable inventory corroding while it awaits use. Protect it with Zerust®. Zerust® products are quick and easy to use—simply pack and store.

Some products used for Inventory Storage applications include:
Zerust® ICT®510-SM Film • Zerust® ActivPak™ Flash Corrosion Inhibitors
Zerust® Axxatec™ 77C Coating • Zerust® ICT®420 VCI Kraft Paper



Corrosion can strike just about anywhere. Protect the integrity of your assets with solutions from Zerust®. Zerust® can help you decrease scrap rates and increase productivity.

Some products used for Work in Progress applications include:
Zerust® Axxaclean™ Rust Remover Series • Zerust® ICT®620-RR Rust Remover
Zerust® ICT® Tote Covers • Zerust® ActivPak™ Flash Corrosion Inhibitors



Zerust® has solutions for items that need protection during actual operation. From electrical control boxes and engine housings to entire crude oil storage tanks, Zerust® solutions prevent failures and minimize downtime to save you money.

Some products used During Operation applications include:
Zerust® ICT® Vapor Capsules • Zerust® ICT® Plastabs® • Zerust® ActivPak™ Flash Corrosion Inhibitors • Zerust® ReCAST • Zerust® Flange Saver™

To find out more about Zerust® Products that are right for your application, please visit www.zerust.com/product

The background of the slide is a close-up, slightly blurred photograph of industrial machinery, possibly a conveyor belt or a large roller. The machinery consists of several parallel metal rollers or belts, with some showing signs of wear or rust. The lighting is dramatic, with strong highlights and deep shadows, creating a sense of depth and texture. A semi-transparent white rectangular box is overlaid on the upper right portion of the image, containing text. A solid red vertical bar is visible on the left side of the slide, partially overlapping the white box.

With more than 30 years of corrosion management experience and a global distribution and technical network of joint ventures representing over 60

*Proof positive that
Zerust® solutions perform.*

countries, NTIC is the leader in innovative corrosion prevention solutions. NTIC has helped over 5,000 clients save money, improve product quality and reliability, reduce negative environmental impact and improve customer satisfaction.

Certifications and Approvals from:
 DaimlerChrysler
 Ford Motor Company
 Petrobras
 Listed on U.S. Military
 Qualified Products List
 Volkswagen

A sampling of our clients:
 Caterpillar
 Cummins Engine Company
 Daimler Chrysler
 Ford Motor Company
 General Electric Company
 General Motors Corporation
 Honda Motor Company
 Petrobras
 Toyota Motor Company
 Various Military Organizations



Case studies.



Zerust® ICT®520-CSL Film protecting a differential unit during service shipment.

Zerust® ICT®520-CSL Film saves packaging time.

Problem: An automotive parts manufacturer needed a faster way to protect parts during service and interplant shipment.

Solution: Zerust® ICT®520-CSL Cold Seal Film eliminated the need for a heat sealer or other closure methods and saved the client 75% in packaging time—all while providing outstanding corrosion protection.



An electrical box protected internally by Zerust® ICT® Vapor Capsules and externally by Zerust® ICT®510-C Film.

Zerust® vs. Desiccant-Barrier packaging.

Problem: An international crating company wanted to replace their desiccant-barrier corrosion prevention method with a more effective, longer-lasting solution.

Solution: Zerust® ICT® Vapor Capsules and Zerust® ICT®510-C Ferrous Film provide corrosion protection for up to five years. In this case, Zerust® successfully protected the client's shipment of factory equipment while it was stored outside for one year. And the total cost of the Zerust® materials was 57% less than the desiccant-barrier packaging method.



A bail-out pump motor protected by a Zerust® ICT®510-C Ferrous Bag. Pump is corrosion-free and ready to use.



Automotive parts protected with Zerust® ICT®510-C Multimetal Film.



A portable load bank being positioned on a Zerust® ICT®520-XF Film Cover.

Zerust® protects marine equipment in highly aggressive environments.

Problem: A major naval organization was facing severe corrosion issues in their aids to navigation, bail-out pump motors and small engines.

Solution: Zerust® Vapor Capsules and Zerust® ICT®510-C Ferrous Film helped the organization significantly reduce their corrosion, which in turn improved the equipment's reliability and the organization's operational readiness.

Z-CIS® and Zerust® protect an automotive export shipment.

Problem: A major international automotive manufacturer experienced numerous corrosion failings when sourcing parts from an emerging economy country.

Solution: The manufacturer decided to implement Z-CIS® for their supply network. The cost of corrosion fell by an annualized \$2M USD within six months after Z-CIS® deployment.

Zerust® ICT®520-XF Film protects military equipment.

Problem: A major military installation was experiencing corrosion on portable load banks for generators while in storage.

Solution: An NTIC representative recommended Zerust® ICT®520-XF Film Covers to protect the portable load banks during storage. The ICT®520-XF Film Covers were very easy to use. The banks were simply rolled onto the bottom of the cover, and the cover was folded over the bank, then closed with its zipper closure. Corrosion stopped immediately, and the workers were very impressed with the product's ease of use.



Rusted flanges without protection.



Zerust® Flange Savers™ protect the pipe flanges on the left in a side-by-side field trial.

The Zerust® Flange Saver™ prevents corrosion on oil pipelines.

Problem: A major oil company wanted to reduce downtime and increase the life of production pipelines. They were experiencing severe rust on flanges, valves and welded joints. These corrosion problems required production line shutdowns to replace these sections of pipe. Often the flange bolts were so rusted that whole sections of pipe needed to be cut out and replaced.

Solution: The Zerust® Flange Savers™ were implemented in onshore and offshore applications and significantly saved operation costs. This easy-to-use product saved time and money by preventing rust on corrosion-prone flanges and keeping the pipeline in operation.



Zerust® ICT® Vapor Capsules offered superior corrosion protection to electronics in hard-to-reach areas of forward fuselage sections.

Zerust® protects aircraft components.

Problem: A major military aircraft manufacturer noticed degradation caused by corrosion in various forward fuselage sections, wing sets and tooling sets. Aircraft parts and components must be pristine, with no imperfections or corrosion, so the organization had to quickly find an effective corrosion prevention solution that was also non-hazardous and environmentally friendly.

Solution: The organization implemented Zerust® ICT® Vapor Capsules at the recommendation of NTIC to protect the forward fuselages, wing sets and tooling sets from corrosion during shipment and storage. Zerust® ICT® Vapor Capsules are non-toxic, non-reactive, non-allergenic and odorless. With the protection of Zerust® ICT® Vapor Capsules, all equipment arrived at its destination free of corrosion.

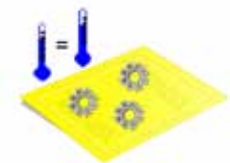
How to use Zerust® ICT® packaging material.



Pack only clean and dry parts.



Wear gloves to avoid leaving acidic, corrosion causing fingerprints.



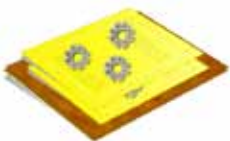
When packing, the ambient temperature and part temperature should be similar to prevent condensation.



Seal packs with zip ties, by heat sealing or by folding and applying waterproof tape.



Insert additional Zerust® packaging materials between layers of packed parts to ensure protection throughout.



Avoid contact between metal parts and wood, paper or cardboard, as these materials contain corrosion-causing acids.

NTIC's commitment to health and safety.

Zerust® ICT® Corrosion Inhibiting Products are safe to use and safe for the environment. Since 1979, Zerust® ICT® Products have been used by more than 5,000 companies and 200,000 people worldwide, with many of them being long-term customer relationships spanning 20+ years. Zerust® ICT® proprietary volatile corrosion inhibiting chemical formulations are odorless, non-toxic, non-flammable, non-reactive and non-allergenic. They do not cause eye, skin or respiratory irritation. In fact, our formulations are comprised mainly of common food additives.

NTIC has been featured on the PBS program, "American Environmental Review," in recognition for being one of the key contributors of advanced technologies that have made a significant positive impact on the earth's environment.*

Zerust® ICT® Products have been cleared by the U.S. Food and Drug Administration for use in protecting metal food containers and processing equipment.*

Zerust® ICT® Products have also been approved by the toxicology departments of various automotive companies. For example:

Toxicology Numbers:

GM (US): 212 149

GM (Canada): 319 146

Chrysler (US): 35 692 1380

TDS (US): 95801

Ford (US) Toxicology Numbers - Product Specific:

Zerust® High Strength Multimetal Film: 154 032

Zerust® Ferrous Film: 041 388

Axxanol™ 33CD: 170 722

Axxanol™ 33: 17592

Zerust® ICT®520-FD Film with Flame Retardant: 178 305

Ford (Brazil) Toxicology Numbers - Product Specific

Zerust® Cushioning Film MM Version: 180 671

Zerust® High Strength Film MM Version: 180 959

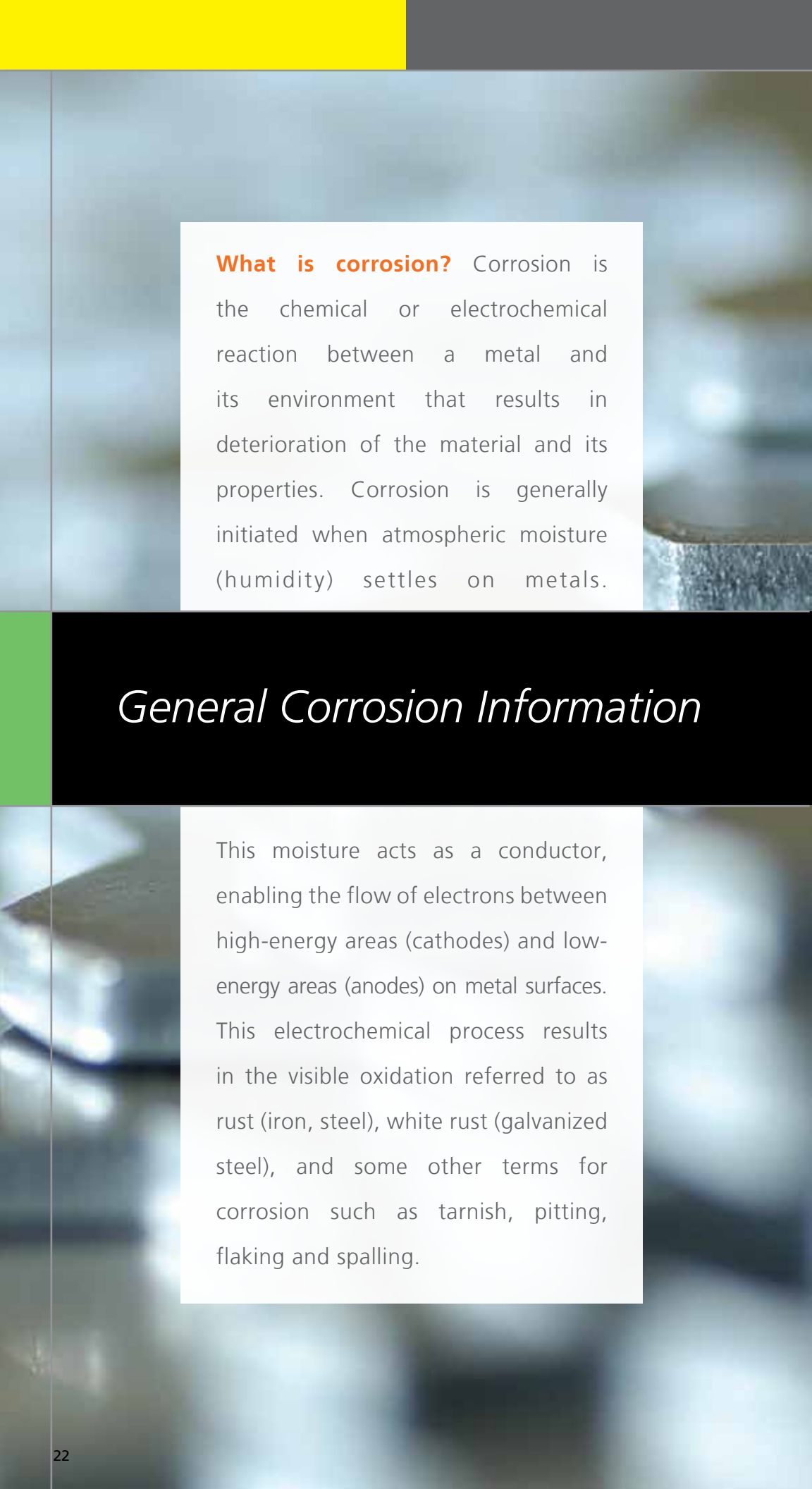
Zerust® ICT® VC2-2 Vapor Capsule: 180 958

Product Approval Numbers:

Toyota: Y0212-01003 (Zerust® Ferrous Sheeting, Size 1)

Toyota: Y0212-01005 (Zerust® Ferrous Sheeting Size 2)

*Copies of reports are available upon request.

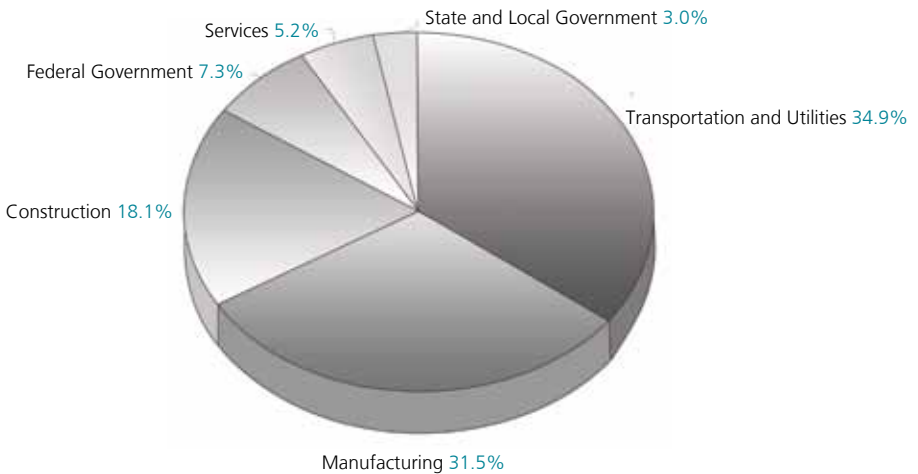


What is corrosion? Corrosion is the chemical or electrochemical reaction between a metal and its environment that results in deterioration of the material and its properties. Corrosion is generally initiated when atmospheric moisture (humidity) settles on metals.

General Corrosion Information

This moisture acts as a conductor, enabling the flow of electrons between high-energy areas (cathodes) and low-energy areas (anodes) on metal surfaces. This electrochemical process results in the visible oxidation referred to as rust (iron, steel), white rust (galvanized steel), and some other terms for corrosion such as tarnish, pitting, flaking and spalling.

Cost of Corrosion in the United States of America: \$276 billion, 3.1% of GDP*



* FHWA funds Cost of Corrosion Study: [CORROSION COSTS AND PREVENTIVE STRATEGIES IN THE UNITED STATES](#). Report by CC Technologies Laboratories, Inc. to Federal Highway Administration (FHWA), Office of Infrastructure Research and Development, Report FHWA-RD-01-156, September 2001.

Types of corrosion.


There are many different types of corrosion, including atmospheric corrosion, corrosion in waters, corrosion in soils, corrosion in chemical environments, mechanically assisted corrosion, high-temperature corrosion, and microbiologically influenced corrosion. From an economic, safety and aesthetic standpoint, atmospheric corrosion is the most notable type of corrosion. Atmospheric corrosion is enabled by atmospheric humidity and stimulated by pollutants such as acid gases [sulfur dioxide (SO_2), hydrogen sulfide (H_2S) and carbon dioxide (CO_2)], nitrogen oxides (NO and NO_2), ozone (O_3) and salts (chlorides and sulfides).



How corrosion is prevented.

Corrosion can be prevented by modifying the atmosphere through dehumidification, nitrogen purge, and evacuation. Another method is by creating a protective barrier on the metal surface against moisture. This barrier can be formed by a liquid coating, such as oil, or via packaging products that work by diffusing corrosion inhibiting molecules from the packaging into the air. These molecules settle on metal surfaces and form a protective corrosion inhibiting layer that inhibits the electrochemical reactions that cause corrosion to form.

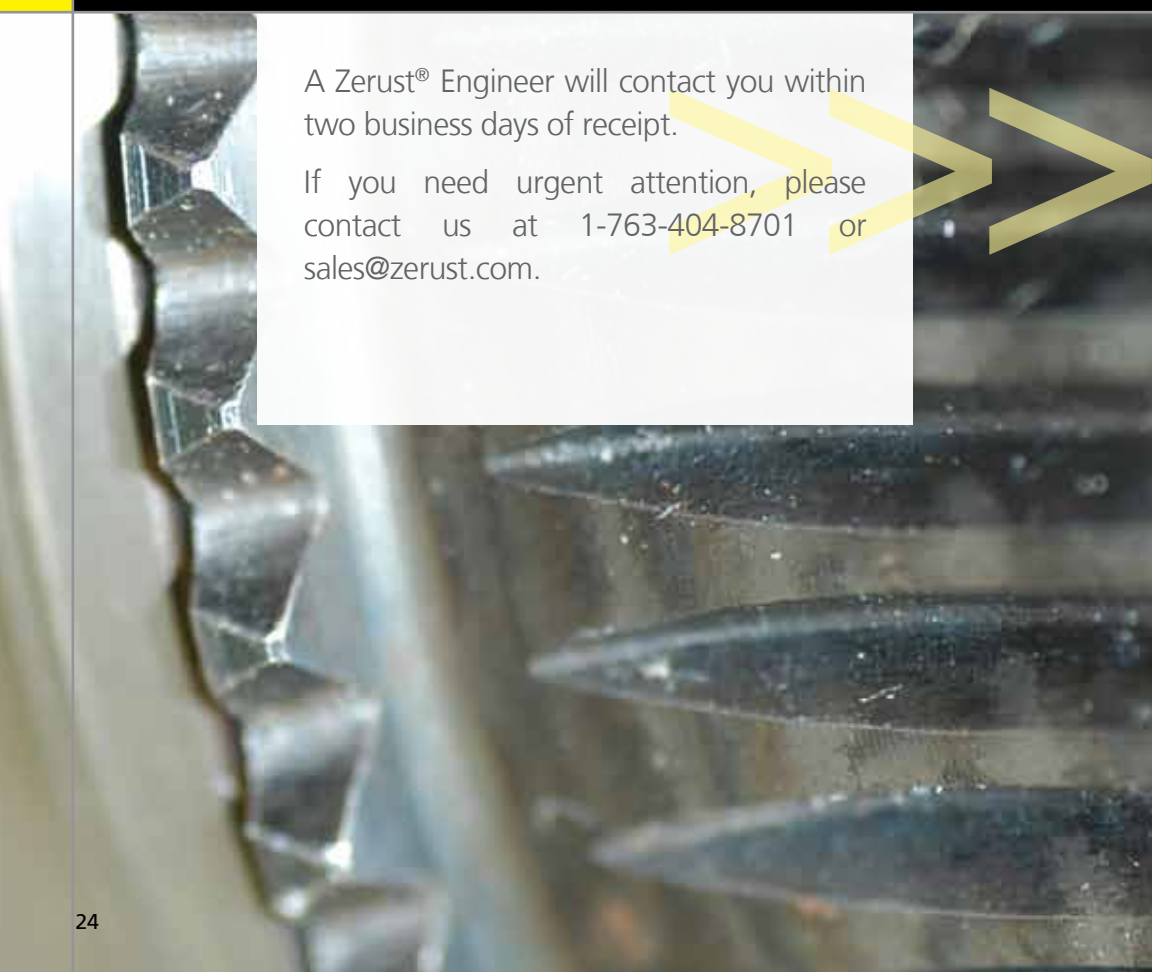
NTIC combines the use of proprietary vapor corrosion inhibitor formulas augmented with acid gas scavengers and other chemical enhancements and process management expertise to implement custom corrosion solutions for a customer or throughout an entire supply chain. We call this our Zerust® Integrated Corrosion Technologies (ICT®).



It's time to put an end to the frustration and worry that corrosion problems have caused your company. In order for the Zerust® Team to help you solve your corrosion problem as quickly and effectively as possible, we ask that you take the following steps:

- Complete and submit the Z-CIS® questionnaire found online at www.zerust.com/tellus
- Take as many photos as possible of the corroded product and its packaging.

How to get started solving your corrosion problems.



A Zerust® Engineer will contact you within two business days of receipt.

If you need urgent attention, please contact us at 1-763-404-8701 or sales@zerust.com.

Company overview.

Northern Technologies International Corporation (NTIC) is in the business of converting unique, environmentally beneficial materials science into value-added products and services for industrial and consumer applications.

NTIC was founded in 1970 in Lino Lakes, Minnesota with its primary business in oil analyzer instruments (then known as Northern Instruments, Inc.). In 1993, Northern Instruments changed its corporate name to Northern Technologies International Corporation. The company has since grown out of the oil analyzer instrument business and into a global provider of corrosion inhibiting products and corrosion control management services with sales and technical support in more than 60 countries.

Consistent with our desire to expand our offering of clean, environmentally beneficial technologies, we have developed patented compostable plastics and renewable resource engineered plastics to further reduce any impact on the environment.

Worldwide support.

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Technology platforms.



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Contact us.



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Warranty Information:

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