



**Green
Packaging
Inc.**

End rust and corrosion. Guaranteed.



RUST KIT 2021

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7 CAUSES OF RUST ON YOUR METAL PARTS


- 1 Oxygen, moisture, and metal together**

Oxygen + moisture + metal = rust. That's your bottom line—and should be your guiding principle. Rust requires all three things. If you can eliminate any single one, rust is impossible. But you can't get rid of the metal when dealing with essential machinery parts. So, you need to focus on keeping moisture and oxygen at bay.
- 2 Contaminants in the air**

Airborne contaminants are tough on metal parts that sit waiting in the manufacturing area for secondary operations like machining, drilling, tapping, packaging, and shipping because they can accelerate rust and corrosion. Moisture, acidic fumes, and other byproducts from your manufacturing process can disperse into the air before landing on surfaces. Exhaust fumes from propane fork trucks—which contain chlorides, sulfides, and oxides—can add to the contaminants in the atmosphere and coat your metal parts. And if you have in-house heat-treating capabilities, the vapors, byproducts, and fumes from that process will also contribute to an environment that fosters rust and corrosion.
- 3 Improper storage or packaging**

You may be unintentionally exposing your metal parts to other materials that can cause rust. Maybe you are tossing them into reusable plastic or metal bins that have become dirty and grimy from use. Or perhaps you shipped them using products like corrugated cardboard boxes, wooden crates, or wood pallets. The dirt in storage bins can easily promote rust and corrosion. Unfinished wood can absorb moisture from the air and remain moisture-laden for a long time. And cardboard products retain chlorides and acids used to make paper products, which can speed the development of rust. Often, when metal parts come into direct contact with any wood product, you'll see "contact corrosion" and sporadic rust, where some parts in a particular shipment will be rusted while others are not.
- 4 Dirty or acidic cleaning solutions**

Metalworking fluids and cleaning solutions are a common cause of rust, especially if they are improperly maintained, dirty, or acidic. If your cleaning fluids are dirty, your metal parts will never truly be cleaned. Contaminants and dirt in the fluids can deposit on the metal's surface and inhibit the drying process. Small metal particles in your fluids—also called "swarf"—may not wash away completely, which can lead to galvanic corrosion. Improperly maintained pH levels in your cleaning solutions make them acidic, which can lead to flash rust. This is particularly important in the final rinse stage of your parts cleaning process. And if you use public water, you may be exposing your metal parts to high chlorine levels or other chemicals that can cause corrosion.



5 Fingerprints

Often overlooked, human handling of metal parts can also lead to rust. Acids, oils, and contaminants on your hands can cause and accelerate corrosion. Usually, you can clearly see fingerprints on the surface of metal parts — especially those that are highly polished or machined. Some unlucky people have a biological makeup that makes their bare hands more likely to leave a rusty fingerprint. Of course, because they're visible, fingerprints are the easiest of all root causes of rust to identify—and the easiest to solve.

6 Incomplete drying

Rust often occurs if metal parts aren't allowed to dry thoroughly after removal from cleaning and rinsing solutions. That's why, stacking your metal parts on top of each or packing them in boxes without thorough drying is a surefire recipe for rust. Wet parts—even if they look dry—will rust when they're stacked on top of each other because any fluid trapped between the parts will act as an electrolyte to form a galvanic cell. Many parts contain areas where water can pool, making them particularly susceptible to rust and requiring extra attention to ensure they dry completely.

7 Temperature fluctuations and high humidity

Failure to maintain consistent temperatures throughout your manufacturing and shipping areas can lead to rust. And, high temperatures are a catalyst for rust. In fact, corrosion rates double for every increase in temperature by 10 degrees Centigrade. Packing, storing, or shipping metal parts in plastic before they've cooled to room temperature creates condensation that promotes rust. High humidity can also cause moisture to form on the surface of your metal parts. If you package your parts in high humidity, you can inadvertently lock that atmosphere into their packaging, creating a perfect environment for rust.


7 WAYS TO PREVENT RUST ON YOUR VALUABLE METAL PARTS

- 1 Create a barrier between your metal parts and the atmosphere**

Rust and corrosion ruin millions of dollars in metal parts every year. Whenever you have metal, oxygen and moisture together, you will likely have rust and corrosion. The only way to do this is to eliminate either moisture or oxygen from reaching your metal parts. There are several effective ways to accomplish this goal. Coating your metal parts with an effective barrier such as paint, oil, or grease is a way to create this type of barrier. Additionally, powder coating or zinc galvanizing your parts will create a barrier. These methods are effective but can be costly and messy. Using desiccants which absorb moisture inside a sealed vapor barrier bag are another option, although this is very expensive, and failure will result with a simple pinhole or incomplete seal on the vapor barrier bag. VCI (Vapor Corrosion Inhibitor) packaging is also an excellent way to prevent rust without some of the disadvantages of the other methods listed above.
- 2 Protect metal parts from airborne contaminants**

Moisture, acidic fumes, and other manufacturing byproducts in the air—especially propane fork truck exhaust, manufacturing equipment fumes, and heat-treating particulates—can settle on metal parts and create and accelerate rust and corrosion. Closing bay doors when the weather is humid or rainy can help. Also try to remove your metal parts from any area in your plant where airborne contaminants and fumes are present. If that isn't practical because of the layout of your plant, you need to take a different approach. Another solution is to cover in-process metal parts with a VCI paper sheet or put them in a VCI poly bag to shield them from harmful contaminants. This is an effective and inexpensive way to prevent corrosion on expensive metal parts due to airborne contaminants.
- 3 Store and package your metal parts properly**

It's easy to unintentionally expose your metal parts to other materials that can cause rust, such as dirty plastic or metal bins, corrugated cardboard boxes, wooden crates, or even wood pallets. Just putting wood or corrugated slip sheets between layers of parts can create corrosion. The best way to prevent it is to use a barrier between your metal parts and the other material. Additionally, keeping your plastic or metal bins clean and free of contaminants will go a long way. Lining your boxes and crates with a VCI bag and covering your pallets with a sheet of VCI poly will create an effective barrier that will eliminate this type of contact corrosion.

A vertical strip on the left side of the page shows a close-up, blurred view of various metal components, likely from a manufacturing process, with different textures and shapes.

4 Maintain clean fluids and solutions
Proper cleaning, titration, and correct pH levels are necessary to keep your metal parts rust-free. Keep your metalworking fluids and cleaning solutions free of dirt and swarf. Check your fluids and solutions for contaminants regularly and ensure clean filters. Maintain the pH levels appropriate to the kind of part you're producing in all your metalworking fluids and parts washing liquids. Ferrous metal parts need a pH level of at least 9.0, and non-ferrous parts (such as copper or alloys like brass and bronze) need a pH level of 7.0–7.5. And if you use water-based metalworking liquids, use distilled or deionized water to dilute them instead of public water, which often contains chlorine or other chemicals that can cause corrosion.

5 Eliminate fingerprints
Never touch or handle metal parts using bare hands. Acids, oils, and contaminants on your hands can cause and accelerate corrosion. All employees who handle metal parts, including production workers, inspectors, and packaging personnel, should wear gloves. These gloves can be cotton, nylon, fabric, latex, rubber—any glove will work. Just make sure they're clean. Gloves are a simple solution to a common problem. So wear gloves—every time.

6 Dry parts before packing or storing
Let your metal parts thoroughly dry after taking them out of cleaning or rinsing solutions. Stacking them on top of each or packing them too soon will surely lead to rust. So, don't do it. Let your parts air dry in wire baskets before packing or storing. Vibratory action, forced air, and heat can help dry the parts more quickly.

7 Maintain constant, moderate temperature and humidity
For every 10 degrees Centigrade increase in temperature in your plant, your corrosion rates will double. Temperature changes cause metal pores to open while creating condensation. And high humidity can also cause moisture to form on the surface of metal parts. So, try to maintain consistent temperatures and low humidity throughout your manufacturing and shipping areas. Install climate controls, air conditioning, or dehumidifiers, if possible.

7 WAYS VCI CAN IMPROVE YOUR COMPANY'S IMAGE & BOTTOM LINE

- 1 Show Your Customers You Care About Their Parts**

Using the most up-to-date, cleanest, safest, and most effective methods of rust and corrosion prevention show your customers that you are concerned about the quality of their products.
- 2 Get Your Logo Printed on VCI Products to Increase Brand Visibility**

You can easily enhance your company's marketing efforts by adding your company logo and contact information to your VCI bags or VCI paper. We can even print instructions for using your product, warranty or return information—or anything else in good taste for that matter—directly on your VCI paper or bags.
- 3 Let Your Customers Know You are Environmentally Conscious**

By using VCI products instead of petroleum-based oils and greases, you show your customers that you and your company are truly green. You also eliminate the need for your customers to turn to solvents to remove oils from their parts before using them.
- 4 VCI Products Are More Affordable Than Oils, Grease & Powder Coating**

Simply put, VCI bags and VCI paper products are less costly than petroleum-based rust preventative oils and greases, powder coating, painting, galvanizing, e-coating, or phosphating. And with VCI, there is no need for expensive machinery or equipment.
- 5 VCI Wrapping Process Reduces Labor Costs**

Placing metal parts in a VCI bag or wrapping them in VCI paper is far less labor intensive than spraying, dipping, or brushing on rust preventative oils on your metal parts. Plus, there is no need for additional labor to clean up spills.
- 6 Rust Free Parts Means More Happy Customers**

When you protect your valuable metal parts with VCI paper and VCI bags, your customers will receive them in a clean, dry, rust-free condition. This helps reduce customer complaints about rusty parts and eliminates return freight costs and the need to sort and re-work rusty parts. And all that goes a long way in eliminating the need for costly and lengthy corrective action reports.
- 7 Recycling Reduces Your Disposal Costs**

VCI bags and VCI paper are recyclable, reducing your disposal costs. Moreover, using VCI for your rust prevention eliminates disposal costs of empty drums of rust preventative oil, plus disposal costs for oily rags.

7 REASONS WHY RUST PREVENTATIVE OILS ARE KILLING YOUR PROFITS, THE ENVIRONMENT & YOUR EMPLOYEES

- 1 Waste from Oil & Grease Removal Makes it into Lakes & Streams**

Preventative oils can pollute lakes, streams, and ground water. In addition, when they are applied to metal parts, hazardous solvents are required to remove the oils before using the parts.
- 2 Volatile Organic Compounds Release Harmful Contaminants into the Air**

Volatile organic compounds (VOCs), which are in many rust preventative oils, pollute the air, add particulates to it, and contribute to water pollution, air pollution, and acid rain. As a result, many municipalities limit the number of VOCs that can be emitted from manufacturing plants.
- 3 Petroleum-Based Oils Contribute to Your Company's Waste**

Reduce, Reuse and recycle are three important principles of sustainability. Reducing the number of petroleum-based oils is always a good idea. Furthermore, our VCI papers are coated on both sides which can reduce the amount of VCI paper needed. Most VCI products are also reusable unless they are soiled or torn. Most VCI products are also recyclable which is good for the environment, and means less disposal costs
- 4 Rust Preventative Oils Contain Chemicals Known to Cause Health Issues**

There are several health issues related to exposure to preventative oils, including eye, nose, and throat irritation, nausea, difficulty breathing, and damage to the central nervous system.
- 5 Many Preventative Oils Also Contain Nitrosamine a known Carcinogen**

Nitrites, amines, and heavy metals can cause skin, eye, throat, and lung irritation. Amines can combine with nitrites to form nitrosamine, a known carcinogen.
- 6 Storing Rust Preventative Oils Pose a Serious Fire Hazard**

Because they are flammable, storing rust preventative oils is a serious fire hazard. In addition, slip-and-fall accidents are common when employees use oils that are easily spilled.
- 7 Residue**

When metal parts don't fully dry, they get a sticky residue--and contaminants in the air that can cause corrosion are attracted to it.

7 WAYS TO BOOST THE EFFECTIVENESS OF VCI PRODUCTS & GET THE BIGGEST RETURN ON INVESTMENT

- 1 Use a Combination of VCI Paper With a VCI Bag**

Using a VCI bag and VCI paper together will provide you with a powerful combination to prevent rust on your valuable metal parts. Within this scenario, the VCI bag provides long-term corrosion protection and an efficient moisture barrier. The VCI paper also offers quick VCI protection and moisture absorbing properties.
- 2 Use a VCI Emitter to Add an Extra Punch of VCI**

Like the effects of using VCI paper and a VCI bag together, a VCI emitter inside a VCI bag increases the effectiveness of your VCI. VCI emitters are available in the form of VCI chips, VCI foam pads, VCI power cards, and VCI wire.
- 3 Make Sure Your Metal Parts Are No More Than 12-18" Away from the VCI Source**

VCI products perform best when they are near the metal that is to be protected. VCI molecules can travel quite a distance. But if they disperse for a long distance, they will separate too much and fail to protect completely. Your VCI product should be within 12" to 18" of the metal to ensure that the VCI molecules are densely populated enough to provide complete coverage.
- 4 Use the Proper Amount of VCI for Your Specific Application**

Using the proper amount of VCI for your application is essential. And, a good rule of thumb is to use at least 1 square foot of VCI paper or VCI poly for every 1 to 3 square feet of metal surface. Alternatively, you can use at least one square foot of VCI for every cubic foot of void space.
- 5 Package Your Metal Parts in VCI Packaging as Quickly as Possible**

When it comes to rust prevention, time is of the essence! So, place them in VCI packaging as soon as your metal parts are dry. Depending on the type of metal you are working with, rust can form very quickly. Thus the quicker you can get them in the protective environment of VCI packaging, the better your results will be.



6

Be Sure to Seal or Zip Tie Your VCI Bag

When you have filled your VCI bag with metal parts, be sure to completely seal or zip tie the bag. VCI molecules must be enclosed to be effective. Do not ship or store metal parts in a VCI bag that is not completely closed or sealed. And if you are placing warm metal parts in a VCI bag, be sure to allow the parts to come to room temperature before sealing or tying the bag closed. This will allow any condensation that may form to escape prior.

7

Store VCI Products in a Cool, Dry Place, Away From Sunlight

For optimum protection, store your VCI products in their original packaging and a cool, dry area that is out of direct sunlight. This will preserve the effectiveness of your VCI. Plus, you should not store VCI products for more than 2 years before using them. Always keep a fresh supply of VCI on hand and be sure to follow a first-in, first-out (FIFO) policy.

7 WAYS RUST GUARD PREMIUM™ VCI IS BETTER THAN DESICCANTS

- 1 Desiccants Must Be Used in an Airtight Environment**

Simply tossing a couple of desiccant packets in a box will do nothing to prevent rust on metal parts. But if you can remove moisture or oxygen from reaching the metal surface, you will eliminate the possibility of rust. That means a desiccant must be used in an airtight environment to be effective—and your choices are a rigid plastic, metal, a glass container with an airtight lid, or a sealed vapor barrier bag with a nylon or foil layer.
- 2 Desiccants Easily Take in Moisture from Outside the Package**

If desiccants are not in an airtight environment, they will draw moisture from outside the package. And, when the desiccant has absorbed all the moisture it can— and is fully saturated—it can begin to give off moisture.
- 3 Desiccants Can Cause Corrosion If They Are in Contact with Metal Parts**

Desiccants do a great job of absorbing moisture. But once a desiccant is saturated and in contact with your metal parts, it can cause rust and corrosion where it is touching the metal.
- 4 Desiccants Must be Kept in an Airtight Container Before Use**

Because they easily absorb moisture, desiccants usually come in an airtight pail or drum. That means that the lid of the container must remain closed except during desiccant removal. But, that's so impractical that it's rarely done. So in most cases, the desiccant is completely saturated before it is even placed in use.
- 5 Mining of Desiccant Material is Bad for the Environment**

Desiccant material, usually clay or silica, is mined. And the mining practices can create problems for the environment. Some of these issues include soil and water contamination, deforestation, and disruption of wildlife habitats.
- 6 Desiccants are Very Heavy & Expensive to Ship**

Desiccants are so heavy that they are generally shipped via motor freight, adding significant costs to the already high price of desiccants.
- 7 VCI Packaging is a Better Choice**

Desiccants can be effective, but only if handled and used properly. Keeping them in an airtight container is often impractical and using them properly in a vapor barrier bag or airtight container is expensive. A better choice is VCI packaging, which is much more effective, simpler to use, and less costly.

7 WAYS RUST GUARD PREMIUM™ VCI PRODUCTS ARE BETTER THAN THE COMPETITION

- 1 Rust Guard Premium™ VCI Products Are Safer**

Rust Guard Premium™ VCI products are safe for the environment and your employees because they contain no nitrites, amines, or heavy metals. In fact, our products are the safest VCI products on the market. And safety has its benefits! Our products can be recycled in the normal recycling stream.
- 2 Rust Guard Premium™ VCI Paper is Coated on Both Sides**

Rust Guard Premium™ VCI paper is coated on both sides. Most competitor VCI papers are coated only on one side. This eliminates confusion on the plant floor and can reduce the amount of VCI paper you need for certain applications.
- 3 Rust Guard Premium™ VCI Bags Are Formulated Specifically for Your Exact Application**

Many VCI companies have one formulation to fill every need. But, Rust Guard Premium™ VCI products are formulated specifically for your exact application and type of metal. We offer different formulations for ferrous metals, non-ferrous metals, and multi-metals. And, we even have a formulation for the protection of cast metals, including grey and ductile iron.
- 4 Rust Guard Premium™ VCI Products are Available in Many Stock & Custom Sizes**

Rust Guard Premium™ Products are available in over 150 stock sizes and are typically available for same-day shipping. Custom sizes are also available.
- 5 Rust Guard Premium™ VCI Products Provide Premium Protection at Economy Prices**

You never pay a premium price for our Rust Guard Premium™ VCI products. Our buying power ensures that you always have the lowest possible price for your VCI products.



6 Rust Guard Premium™ VCI Products Have More VCI Concentrate
Rust Guard Premium™ VCI Products have a higher percentage of VCI concentrate as compared with most competitive VCI products. This is important because the amount of VCI concentrate is a direct function of how quickly the corrosion protection sets up. Plus, it determines your length of protection, as well as your overall protection effectiveness. In addition, Rust Guard Premium™ products do not contain less expensive—and less effective—VCI ingredients like sodium nitrite.

7 Recycling Reduces Your Disposal Costs
For more than 15 years, Rust Guard Premium™ VCI Products have been used and trusted by North America's largest foundries, metal stamping companies, automotive companies, powdered metal parts manufacturers, precision machine shops, spring and wire form manufacturers, aerospace companies, firearms manufacturers, and metal parts manufacturers in many other industries.



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