What does Packaging Preservation Mean?

The concept of preserving metals (parts, equipment of all shapes and forms) dates back to ancient times. Once man had developed the means of making metal—the need to protect it from corrosion was also needed. Over the years methods of protection have ranged from primitive wax or oils to painting and special deposits on the surface of metals. Basic metals such as steel, brass, copper, aluminum, cast iron are very prone to corrosion induced by direct water and oxygen. In addition to the acidic atmosphere of industrial manufacturing creates opportunity for corrosion. The most aggressive locations for corrosion are typically the ocean or sea side coast line.

Packaging Materials are very effective for blocking the water vapor and oxygen from the metal surfaces.

The modern day packaging options to prevent corrosion are:

VpCI Packaging:

- Cleaning of parts is not required—but clean surfaces attract more molecules
- No residual surface contamination from molecules
- Air tight packaging is not required—simply keep the package closed when not in use
- Effective temperature range (-40F to +160F)
- No desiccants (moisture absorbents) needed
- Air inside of the package is not a problem—not required to "remove by vacuum"
- Any size of enclosure may be manufactured and protected by adding VpCI emitters

Traditional Barrier Packaging:

- Parts normally need pre-cleaning & rust preventative oils are applied
- Rust preventative oils that have been applied normally need to be removed from metal
- Desiccants are required to adsorb moisture inside of the barrier package
- Barrier packaging requires are an air tight enclosure and the air inside of the package kept at 40% or lower relative humidity
- Periodic monitoring of the package is normally required to assure integrity of the packaging
- Desiccants may needed to be replaced

Product Preservation Considerations

What type of metals are involved?
Are there existing oils, coatings, paint on the surface of the metal?
How long will the part be stored?
Where will the part be stored?
Is there a need for lubrication on the part?

What is VpCI?

- Manufactured process creates a carboxylate amine salt
- This chemistry is safe to environment, animals and people
- The purpose of the chemistry to introduce a molecule that will interrupt the developing rust cell
- The VpCI molecule is attracted to the metal surfaces and the metal is more readily willing to receive the VpCI
- In this attraction the VpCI molecules are more readily drawn to the surface and as a result they align on the surfaces of the metal
- The VpCI molecules are attracted to the "positive and negative" sides of the potential rust cell
- The VpCI molecules will cover the entire surface of the metal and be continually repelling the water and oxygen molecules
- The VpCI molecules will protect for years
- The VpCI molecules are not attracted to anything except metal and they will not have any effect on any components.

The Value of 30 + years of Industrial Packaging
Available from our www.StopRustandStow.com

We have developed a line of ready to use products that will protect your everyday items
Grills, Bicycles, Golf Clubs, Fishing Equipment, Power Generators, Skateboards etc

Ideal for items stored in Public Storage Buildings that you do not use regularly

Our design is based on the Internationally Recognized Technologies of Cortec Corp

Environmentally Safe for everyone and everything

We have developed our product line on "Green Technologies"

What does the rust or corrosion process look like?

The metal surfaces are made from base materials such as iron, steel, aluminum, copper, silver, gold and brass or more complex blends. The easiest most common form of rust is the red rust on steel or iron parts. This rust is created by the water and oxygen molecules that come to REST on THE METAL SURFACES. These “RESTING MOLECULES” are really quite busy while they “REST”. Surface rust is the result from this attraction.

The METAL SURFACES naturally attract the water, oxygen and sodium chlorides (salts) to those exposed surfaces. Acting as a magnet the more the surfaces take on these “BAD MOLECULES” the faster and heavier the surfaces RUST.

Water dropping on to metal creates 2 actions. The water, being a weak electrolyte combines with carbon dioxide in the air to form a weak carbonic acid. This carbonic acid and the dissolved iron will continue to break down into hydrogen and oxygen. The free oxygen and dissolved iron bond into iron oxide, this releases electrons. It is the flow of electrons liberated from the anode portion of the iron will flow to the cathode. In doing so the rust cell grows

As stated above, water and oxygen molecules react with the oxides of the metals to form an electrolyte film that is very effective in breaking down the base metal. This process works on the same principle of a common battery. The - (Anode End) and + (Cathode End) of the battery are the “connections” that direct the energy of the chemical reaction to power your Ipod, flashlight, radio or whatever your battery is powering.

The temperature, air contamination as well as deposits on the metal surface play a part in how fast the metal will corrode. An iron part will begin to ‘RUST” at about 60% relative humidity. In aggressive environments such as OCEAN SIDE the “RUST” will occur faster and sooner. Temperature changes on the metal will create condensation which places water and oxygen directly on the metal!

The OCEAN SIDE environment creates a more aggressive AIR because of the evaporation of the SALT WATER into the atmosphere. Sodium Chloride (salt) when mixed with the water (moisture) in the air (oxygen) creates an EXTREMELY ACTIVE cell site on the metal surface. This blend will attack all metals much faster when located close to salt water environments.

VpCI based Packaging Materials

VpCI— Blue Polyethylene Film protects 3 years indoor storage

VpCI-MilCorr protection for 5 to 7 years outdoor storage—UV inhibitors

VpCI Paper Based Material protection for 2 years indoor storage

VpCI– Emitters vaporization for 2 or more years when combined with our film packaging

84 Days UV Chamber Testing
No Breakdown of MilCorr Film
No Corrosion on Metal Plates

Procedure: MilCorr VpCI Shrink film, was heat shrunk onto three carbon steel panels, the panels were then placed into UV chamber. MilCorr VpCI Shrink film (white colored), was heat shrunk onto three carbon steel panels, the panels were then placed into UV chamber. Carbon steel panels were heat sealed in low density polyethylene film, and placed in UV chamber.

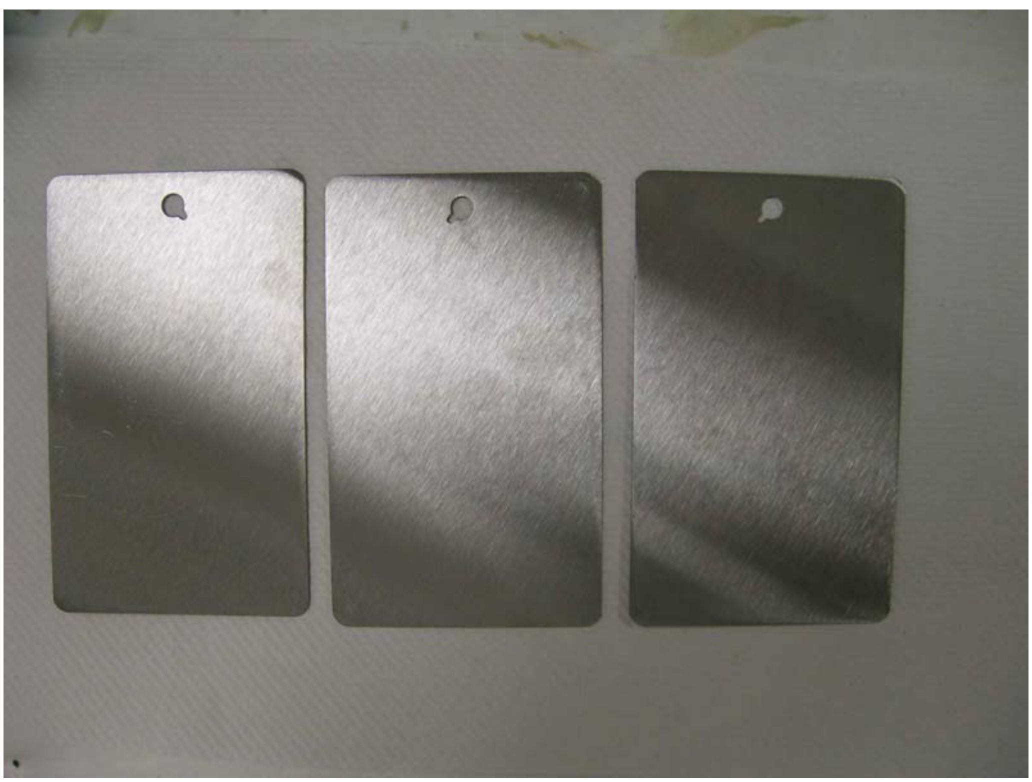
Results:

ASTM G53

Material	Results after 84 days
MilCorr VpCI Shrink film, 10 mil	No change in film appearance
MilCorr VpCI Shrink film, 10 mil	No change in film appearance
MilCorr VpCI Shrink film, 10 mil	No change in film appearance
MilCorr VpCI Shrink film (white colored), 10 mil	No change in film appearance
MilCorr VpCI Shrink film (white colored), 10 mil	No change in film appearance
MilCorr VpCI Shrink film (white colored), 10 mil	No change in film appearance
Low density polyethylene, (control), 10 mil	Carbon steel panel is heavily corroded, Low density polyethylene film is severely ripped

Photos attached

Conclusion: MilCorr VpCI Shrink film and MilCorr VpCI Shrink film (white colored) provided excellent ultraviolet light resistance for 84



MilCorr VpCI Shrink Film

MilCorr Testing for Outdoor Stability
Tear Strength, Corrosion Protection

Background: MilCorr VpCI Shrink film has undergone a change in construction. The first commercial production run of the new version of MilCorr VpCI Shrink film, was done on October 28, 2002. An evaluation is sought on this new construction of MilCorr VpCI Shrink film.

Purpose: Evaluate the corrosion inhibition, mechanical strength and UV Stability of new version of Mil-Corr VpCI Shrink film

Procedure: The Razor Blade Test, VIA Test and SO_2 Tests were performed according to standard procedures for each.
Modified ASTM D 1748-83 (Outdoor exposure) was performed by using heat gun and heat shrinking MilCorr VpCI shrink film around carbon steel object. Placement of item wrapped with MilCorr VpCI shrink film in outdoor environment was undertaken.

Results:

Razor Blade Test

Material	Panel #1	Panel #2	Panel #3
MilCorr VpCI shrink film	Pass	Pass	Pass
Non-corrosion inhibitor treated film (control)	Fail	Fail	Fail

VIA Test

Material	Panel #1	Panel #2	Panel #3
MilCorr VpCI shrink film	Grade 3	Grade 3	Grade 1
Non-corrosion inhibitor treated film (control)	Fail	Fail	Fail

SO_2 Test

Material	Panel #1	Panel #2	Panel #3
MilCorr VpCI shrink film	Grade 4	Grade 4	Grade 4
Non-corrosion inhibitor treated film (control)	Fail	Fail	Fail

Modified ASTM D 1748-83 (Outdoor exposure): 13 months of outdoor exposure

Material	Qualitative Description of film
MilCorr VpCI Shrink Film	No significant change*

*Photos enclosed
Note: A heat gun was used to shrink the film with an operating temperature of ~ 500-800 deg F.

Mechanical Strength Testing performed by Kim Peterson @ CAFD

Test Method	MilCorr VpCI Shrink film produced prior to Oct 28, 2002	MilCorr VpCI Shrink film produced after Oct 28, 2002
Tensile Strength @ Break (ASTM D 882-91)	3451.8/2049.9 psi	> 3451.8/2049.9 psi (Film did not break)
Elongation % @ break (ASTM D 882-91)	731.5/884.7 %	> 731.5/884.7 psi (Film did not break)
Tear Strength @ Break (ASTM D 1922)	480.4/2624.0 gf	1322.67/2954.67 gf
Impact Puncture (ASTM D 3420-95-B)	0.325 J	3.77 J

Machine Direction/Cross Direction

Conclusion: MilCorr VpCI shrink film provides excellent contact and barrier corrosion inhibitor protection. MilCorr VpCI shrink film provides adequate vapor phase corrosion inhibition. After 13 months of outdoor exposure, there is no significant deterioration to the current version of MilCorr VpCI Shrink film. Mechanical strength test results show the current MilCorr VpCI Shrink film to be superior in every category.