ALBACETE Y ALA 14
AIR BASE - SPAIN

ANTICORROSION - THE TEMPORARY PROTECTION OF A MIRAGE F1 FOR THE SPANISH AIR FORCE

December 2003
APPLICATION STUDY OF ANTICORROSION PROTECTION FOR THE STORAGE OF MIRAGE F1 AIRCRAFT

SPANISH AIR FORCE
AIR BASE ALBACETE - SPAIN
CONTENTS

1. OBJECTIVE

2. ANTICOROSION PROTECTION

3. PRODUCT DATA SHEETS

4. NORMS and CERTIFICATIONS
1. OBJECTIVE

The Objective of this technical study utilizing the vapor phase corrosion inhibitors (VpCI™) is to perform the anticorrosion protection of 4 Mirage F1 aircraft for the Spanish Air Force, while being stored at the Air Base de los Llanos (Albacete), Spain.

The Study was carried out with products that are ISO 9001 certified and conform to Military norms in order to guarantee the maximum amount of protection as possible.

The protection consists of the use of Vapor phase Corrosion Inhibitors manufactured by Cortec® Corporation (St. Paul, MN, USA) distributed in Spain by Quimilock s.a. (Madrid).

Below, Cortec’s VpCI™ protection is explained:

**How Cortec® VpCIs Work.**

**Ionic Action of VpCI Creates a Molecular, Inhibiting Layer.**

- **VpCl:**
  - Vaporizes.
  - Conditions enclosed atmosphere with a protective vapor.
  - Vapor migrates to all recessed areas and cavities.
  - Vapor condenses on all metal surfaces.
  - Ions dissolve in moisture layer (water electrolyte).
  - Protective ions are attracted to metal surfaces.
  - Ions form a thin, monomolecular protective layer at the metal surface.
  - Protective layer re-heals and self-replenishes through further condensation of the vapor. VpCl combines with other functional properties:
    - Antistatic
    - Lubricating
    - Cleaning
    - Paint Removing
    - Desiccant
    - Polymeric Coatings
    - Rust Removing
    - Fire Retarding
2. ANTICORROSION PROTECTION

For the present study 4 Mirage F1 aircraft were used

2.1 SELECTED PRODUCTS

2.1.1 MilCorr film: the film is to be converted in advance by Quimilock enabling to accelerate, at the Air base the wrapping and sealing operations. Estimated film consumption: 3 rolls (8.5 x 45.7 meters)

2.1.2 VpCI™-101 foam: total amount 400 Devices
2.1.3 VpCI™-111 emitters: total amount 104 Devices
2.1.4 VpCI™-Eco Spray 238: total amount 12 Cans
2.1.5 VpCI™-415 cleaner: total amount 8 pails (5 gal./19 liters each)
2.1.6 VpCI™-369: one box with 6 aerosol cans
2.1.7 Preservation Sealing Tape # 4811: one box with 12 rolls (33 meters)

2.2 APPLICATION PROCEDURE

1st- WASHING AIRCRAFT
The aircraft surface should be dry and clean from the presence of impurities, such as oil, grease or any other material that later on may adversely affect the inhibitors protective action.
The aircraft should be washed with VpCI™-415 cleaner (MIL-PRF87937D) with a dilution of 1 part of VpCI™-415 into 20 parts of water. Because of the importance of the cleaning action, this operation needs to be carried out by specialized personnel.

2nd- PROTECTING INTERNAL CAVITIES
To this end, in the internal spaces such as the reactor tunnel, flying instrumentation cabinetry and others void areas, place according to the volume to be protected by the foam.
VpCI™-101 NSN 6850-01-338-1392,
MIL PRF 81705D or the emitter
VpCI™-111 NSN 6850-01-408-9025, MIL 1-122110C.
3rd- PROTECTION OF THE ELECTRICAL CONTACTS
Apply spraying over the electrical connections
VpCi™-238 NSN 6850-01-413-9361

4th- PROTECTION OF THE LANDING GEAR
Apply VpCi™-369 NSN 8030-00-244-1297 and
NSN 8030-00-244-1298 MIL C- 16173E (Grade 1,2 &4)

5th- EXTERNAL AIRCRAFT PROTECTION
By means of the MilCorr film according to the norms MIL-PRF 22019D and MIL-B-22020D related to the use of corrosion vapor phase inhibitors with plastic films.

As shown by the photographic documentation, the different parts of the aircraft are carefully wrapped. The MilCorr film will be properly folded, films edges are heat sealed and the total “package” is then blocked with the Preservation Sealing Tape #4811.
3. PRODUCT DATA SHEETS
PRODUCT DESCRIPTION
VpCI-101 devices are designed to provide corrosion protection for metal components and parts enclosed in non-ventilated control boxes, cabinets or tool boxes. A VpCI-101 device protects up to 1 cubic foot (28 liters) in volume. VpCI-101 is a small patented foam device from which Vapor phase Corrosion Inhibitors are slowly released. The VpCIs emit vapors that form a molecular layer on metal surfaces to protect critical, complex and expensive electronic equipment and other metal components during operations, shipping or storage. VpCI-101 provides long-term protection against corrosion even in the presence of adverse conditions including salt, moisture, airborne contaminants, H$_2$S, SO$_2$, NH$_3$ and others.

FEATURES
- FDA and USDA approved
- Economical to use
- Convenient to install
- Provides continuous protection up to 24 months during operation and/or shutdown
- Effective in polluted and humid environments
- Does not interfere with electrical, optical or mechanical performance
- Multimetal protection
- Quick and easy installation
- Non-toxic and safe to handle
- Compact and space-saving
- Free of nitrates, silicones and phosphates
- No spraying, wiping or dipping required
- Self-stick back
- Self-stick date label
- Meets Southern California Clean Air Act, and other National and local regulations
- NSN* #6850-01-338-1392
- Meets MIL-PRF-81705D

METHOD OF APPLICATION
VpCI-101 devices are extremely simple and convenient to install. The devices should be installed at the earliest possible time, preferably during manufacture or assembly. Simply select a space within any enclosure where corrosion protection would be useful. Verify the surface to which the device will be affixed is clean and free of debris. Peel off the protective peel strip from the bottom of the device and attach it to the clean surface. VpCI-101 devices

TYPICAL APPLICATIONS
- Operating, packaged and stored electrical equipment
- Marine navigation and communication equipment
- Aerospace electrical controls
- Electric motors
- Switching equipment
- Fuse boxes and power boxes
- Medical equipment
- Electrical wireways and terminal boxes
can be installed in any position. For volumes greater than 1 cubic foot (28 liters), use more than one device. If the enclosure is not totally airtight, or if the access doors are opened frequently, replace the VpCI-101 device more often than every 2 years. After periods of heavy maintenance replace the device. For additional protection spray the enclosure very lightly with Cortec® ElectriCorr® VpCI-238 or VpCI-239.

**SPECIFICATIONS**

- **Standard Size**: Foam device with adhesive backing
  - 3” (L) x 1¼” (W) x ¼” (H)
  - (7.6 cm x 3.2 cm x 0.6 cm)
- **Packaging**: 50 individually wrapped devices
- **Protection**: 1 ft³ (28 Liters) per device

**LIMITED WARRANTY**

All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed.

Cortec Corporation warrants Cortec® products will be free from defects when shipped to customer. Cortec Corporation’s obligation under this warranty shall be limited to replacement of product that proves to be defective.

To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer.

Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products.

**FOR INDUSTRIAL USE ONLY**

**KEEP OUT OF REACH OF CHILDREN**

**KEEP CONTAINER TIGHTLY SEALED**

**NOT FOR INTERNAL CONSUMPTION**

**CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION**

Distributed by:

4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
Internet http://www.CortecVpCI.com

© 1999, Cortec Corporation. All Rights Reserved. Copying of these materials in any form without the written authorization of Cortec Corporation is strictly prohibited.
PRODUCT DESCRIPTION
VpCI-111 emitters are unique devices designed to provide corrosion protection for metal components and parts enclosed in non-ventilated control boxes, cabinets or tool boxes up to 11 cubic feet (312 liters). The VpCIs (Vapor phase Corrosion Inhibitor) emit vapors, which form a molecular layer on internal metal surfaces to protect critical, complex and expensive electronic equipment during operation, shipping or storage. VpCI-111 is a small, patented plastic emitter with a breathable Tyvek® membrane through which corrosion inhibitors are slowly released. VpCI-111 provides long term protection against corrosion even in the presence of adverse conditions including salt, moisture, airborne contaminants, H₂S, SO₂, NH₃ and others.

TYPICAL APPLICATIONS
• Operating, packaged and stored electrical equipment
• Marine navigation and communication equipment
• Aerospace electrical controls

FEATURES
• Economical to use
• Provides continuous protection for up to 24 months during operation and/or shutdown
• Effective in polluted and humid environments
• Does not interfere with electrical, optical or mechanical performance
• Contains desiccant properties
• Multimetal protection
• Quick and easy installation
• Very convenient to install
• Non-toxic and safe to handle
• Compact, space-saving
• Free of nitrates, hydros, and phosphates
• No spraying, wiping or dipping required
• VOC values meet Southern California Clean Air Act and other National and local regulations
• Self-stick back
• Self-stick date label
• NSN# 6850-01-408-9025
• FDA and USDA approved
• Canadian Food Inspection Agency approved
• Approved for U.S. military and NATO
• Conforms to MIL-I-22110C
METHOD OF APPLICATION
VpCI-111 is extremely simple and convenient to install. VpCI-111 emitters should be installed as early as possible, preferably during manufacture or assembly. Simply select a space within any enclosed device where corrosion protection would be useful. Verify that the surface on which the device will be installed is clean and free of debris. Peel off the protective peel strip from the bottom of the device and attach it to the clean surface. The peel strip can be separated to reveal a self-adhesive sticker on which the installation and replacement dates can be noted. VpCI-111 emitters can be installed in any position. For volumes greater than 11 ft³ (312 L), install more than one VpCI-111. If the enclosure is not totally air-tight or if the access doors are opened frequently, replace the VpCI®-111 emitter more often than every two years. After periods of heavy maintenance, replace the emitter. For additional protection spray the enclosure very lightly with ElectriCorr® VpCI-238.

PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Green cup with Tyvek® lid</td>
</tr>
<tr>
<td>Protection</td>
<td>11 ft³ (312 Liters) / emitter</td>
</tr>
<tr>
<td>Standard size</td>
<td>Plastic device cup with breathable membrane 2.25 in. diameter x 1.27 in. H (5.7 cm x 3.2 cm)</td>
</tr>
</tbody>
</table>

PACKAGING AND STORAGE
Product should not be exposed to temperatures of over 185°F (85°C). VpCI-111 is available in 10 individually wrapped emitters per carton.

FOR INDUSTRIAL USE ONLY
KEEP OUT OF REACH OF CHILDREN
KEEP CONTAINER TIGHTLY SEALED
NOT FOR INTERNAL CONSUMPTION
CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

LIMITED WARRANTY

Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. No representation or recommendation contained herein shall have any force or effect unless in a written document signed by an officer of Cortec Corporation.

The foregoing warranty is exclusive and in lieu of all other warranties, express, implied or statutory, including without limitation any implied warranty of merchantability or of fitness for a particular purpose. In no case shall Cortec Corporation be liable for incidental or consequential damages.

Distributed by:

4119 White Bear Parkway, St. Paul, MN  55110  USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
Internet http://www.CortecVpCI.com

printed on recycled paper  10% post consumer
Revised 5/23/06. Cortec Corporation 2001-2006. All rights reserved. Supersedes: 5/1/06.
ElectriCorr® is a trademark of Cortec Corporation.
Tyvek® is a registered trademark of E.I. DuPont de Nemours and Company.
© 2001-2006, Cortec Corporation. All Rights Reserved. Copying of these materials in any form without the written authorization of Cortec Corporation is strictly prohibited.
VpCI-369

**PRODUCT DESCRIPTION**
VpCI-369 is our best inhibitor for use as an oil additive and/or temporary coating. The protective film is self-healing and moisture-displacing, providing superior protection against aggressive environments. VpCI-369 is also excellent for mothballing, shipping or storage of parts and equipment when used as an oil additive. In small percentages, VpCI-369 has a minimal effect on viscosities.

VpCI-369 is available in the prediluted form in the ratio 2:1 as VpCI-369 H.

**FEATURES**
- Self-healing.
- Temperature stable up to 180°F (82°C).
- Excellent lubricity.
- Extends tool life for metalworking operations.
- Excellent outdoor protection.
- Excellent oil additive.
- Dilutable with oil.
- Meets MIL-PRF-16173E (Grade 1, 2 & 4)
- NSN 8030-00-244-1295
- NSN 8030-00-244-1297
- NSN 8030-00-244-1298
- NSN 8030-01-149-1731

**TYPICAL APPLICATIONS**
- Wire rope
- Electrical connections/wiring
- Sheltered coating
- Gear protectant/lubricant
- Long-term (5+ years) equipment lay-up
- Stamping oil additive
- Drawing oil additive
- Cylinders
- Working/moving parts

**PROTECTION PROPERTIES**

<table>
<thead>
<tr>
<th></th>
<th>ASTM</th>
<th>DFT</th>
<th>Carbon Steel (1010)</th>
<th>Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity</td>
<td>D-1748</td>
<td>1-mil (25 microns)</td>
<td>7000+ hr</td>
<td>3000+ hr</td>
</tr>
<tr>
<td>Salt Spray</td>
<td>B-117</td>
<td>1-mil (25 microns)</td>
<td>500+ hr</td>
<td>1000+ hr</td>
</tr>
</tbody>
</table>

**METALS PROTECTED**
- Silver
- Cast Iron
- Stainless Steel
- Copper
- Magnesium
- Aluminum
- Carbon Steel

**MINIMUM REQUIREMENTS FOR SURFACE PREPARATION**

<table>
<thead>
<tr>
<th>NACE</th>
<th>SSPC</th>
<th>ARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>7-63</td>
<td>As low as B-3</td>
</tr>
</tbody>
</table>

Methods for Monitoring:
Wet Film Thickness Gauge

**TYPICAL PROPERTIES**

- Appearance: Brown/tan viscous liquid
- Film Type: Oily
- Flash Point: 233°F (112°C)
- Shelf Life: 24 months @ 75°F (24°C)
- Non-volatile Content: 94-98%
- Theoretical Spread Rate: 500-525 ft²/gal @ 3 mils (12-13 m²/l @ 75 microns)
- Viscosity: 10,000-40,000 cps
- Weight per Gallon: 7.7-8.2 lb/gal (0.92-0.98 kg/l)
APPLICATION

Product Preparation:
Product should be mixed thoroughly and uniform prior to use.

Product Application:
Product can be applied by spray, brush, roll or dip.
Normal DFT is 2 mils (50 microns). Apply VpCI-369 in a well-ventilated area.

Product Cleanup:
For cleanup of tools and overspray, use alkaline cleaners such as Cortec® VpCI-414 or mineral spirits

LIMITATIONS

VpCI-369 can be removed if applied in splash zones, heavy rains or similar conditions. Parts protected with VpCI-369 should be sheltered for best results.

PACKAGING

VpCI-369 is available in 5 gallon (19 liter) plastic pails, 55 gallon (208 liter) metal drums and 11 oz. (312 g) aerosol cans. VpCI-369 is also available in diluted forms.
**PRODUCT DESCRIPTION**

ElectriCorr® VpCI-238 is an electronic cleaner containing Vapor phase Corrosion Inhibitor. This cleaner is specifically formulated for electrical/electronic equipment and components. ElectriCorr® VpCI-238 forms a thin film of Vapor phase Corrosion Inhibitors effective against aggressive environments, including industrial, marine and tropical climates. This film does not alter the electrical resistance or magnetic properties of metal substrates. ElectriCorr® VpCI-238 can be safely applied to protect circuits or relays without causing any changes in conductivity. It can be safely used with most plastics, elastomers and other non-metallics.

ElectriCorr® VpCI-238 is an effective inhibitor of galvanic corrosion for most metals and alloys normally found in electronics applications, such as aluminum, copper, ferrous and other non-ferrous metals. ElectriCorr® VpCI-238 is non-conductive and free of CFCs and 1,1,1-Trichlorethane. Application provides instant corrosion protection. In cases where severe corrosion may occur, ElectriCorr® VpCI-238 can be used along with VpCI-100 series impregnated foam devices for extended protection.

**FEATURES**

- Instant corrosion protection
- Long-term multi-metal protection
- Minimized field service
- Increased corrosion protection at a lower cost than conventional rust preventatives
- CFC- and 1,1,1-Trichlorethane-free
- Vapor phase protection in vented or unvented enclosures
- May be used as a cleaning agent
- Moisture-displacing and penetrating film characteristics
- In aerosol NSN #6850-01-413-9361

**TYPICAL APPLICATIONS**

- Printed circuit boards
- Electrical contacts and components
- Electric motors
- Corrosion protection of different metals in humid environment
- Generators and junction boxes
- Spray for use after final assembly or in the field

**INDEPENDENT TESTING**

ElectriCorr® VpCI-238 has been tested by a world-renowned laboratory under accelerated conditions per the Batelle Flowing Mixed Gas Test in a Class III environment. The results showed excellent multi-metal protection equivalent to a 7-years protection interval in an indoor electronics environment.
APPLICATION
Dip part to be cleaned and/or protected into a bath of ElectriCorr VpCI-238. Remove excess by drip, wipe or other conventional method. Forced air is not recommended due to possible condensate and/or compressor oil contamination.

The amount of ElectriCorr VpCI-238 necessary to maintain a sufficient concentration of vapors will depend on factors such as the efficiency of sealing enclosures (air circulation), volume of the enclosure, atmospheric conditions and the density/porousness of the walls.

Application is effective for 6+ months with proper controls.

PACKAGING AND STORAGE
ElectriCorr VpCI-238 is available in 5 gallon (19 liter) pails, 55 gallon (208 liter) drums, liquid totes and bulk. ElectriCorr VpCI-238 is also available in aerosol form, packaged in cartons of six 9.45 oz (267.75 gram) cans. ElectriCorr VpCI-238 should be kept from high temperatures and in normal warehouse conditions to prevent from freezing. ElectriCorr VpCI-238 has a shelf-life of 3+ years in sealed packages.

PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear yellow liquid</td>
</tr>
<tr>
<td>Non-volatile Content</td>
<td>7-10%</td>
</tr>
<tr>
<td>Density</td>
<td>6.5-6.8 lb/gal (0.77-0.81 kg/l)</td>
</tr>
<tr>
<td>Flash Point</td>
<td>143½°F (62½°C)</td>
</tr>
</tbody>
</table>

LIMITED WARRANTY
All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed.

Cortec Corporation warrants Cortec® products will be free from defects when shipped to customer. Cortec Corporation's obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer.

Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products.

BEFORE USING, USER SHALL DETERMINE THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE, AND USER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION THERewith. No representation or recommendation not contained herein shall have any force or effect unless in a written document signed by an officer of Cortec Corporation.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO CASE SHALL CORTEC CORPORATION BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.
VpCI™-415

DESCRIPTION
VpCI-415 is a heavy-duty biodegradable water-based alkaline cleaner and degreaser offering unique flash corrosion protection. VpCI-415 can provide corrosion protection for up to 6 months during indoor storage. VpCI-415 is formulated to meet the requirements for cleaning and corrosion protection of aircraft.

The compounds contained in VpCI-415 function by altering hydrocarbons so that the deposits can be removed with water. VpCI-415 can be metered into power washers, steam cleaners, dip tanks and other cleaning equipment. Along with good detergent properties, VpCI-415 is hard water stable.

While most cleaning compounds available on the market today are simple blends of surfactants and detergents which limit their cleaning effectiveness, VpCI-415 offers improved cleaning plus multimetal corrosion protection action in one step, resulting in significant savings. VpCI-415 has the unique ability to remove such deposits as heavy hydrocarbons, grease, drawing, buffing machinery compounds.

FEATURES
• Biodegradable
• Heavy-duty chemical cleaner and degreaser with unique cleaning action for removing hydrocarbon deposits
• Provides temporary multimetal corrosion protection
• Provides exceptional resistance to pitting corrosion
• Non-toxic, non-corrosive and does not contain nonylphenol ethoxylates
• Provides excellent cleaning action at low temperatures
• Mild foaming
• Exhibits hard water tolerance
• Formulation remains stable during freeze-thaw cycle
• Conforms to:
  • Tested:
    • MIL-PRF-87937D
    • ASTM D 2240
    • ASTM F 483-90
    • ASTM F 484-93
    • ASTM F 485-98
    • ASTM F 502-93 F
    • ASTM F 519-93 Type 1C
    • ASTM F 1104-87
    • ASTM F 1110-90
    • ASTM F 1111-88
EFFECTIVE USES

• Aircraft
• Machinery contaminated with oils
• Sheet metal coated with temporary protective oils or waxes prior to painting
• Metal parts contaminated with stamping, drawing or buffing compounds

APPLICATION

VpCI-415 can be applied with any conventional equipment including sprayers, dipping tanks, steam cleaners and power washers.

Heavy-duty Cleaning and Corrosion Protection:
1 part VpCI-415 to 4 parts water.

Normal Cleaning (i.e. parts washing):
1 part VpCI-415 to 10 parts water.

Light Cleaning (i.e. rinsing):
1 part VpCI-415 to 20 parts water.

FOR INDUSTRIAL USE ONLY
KEEP OUT OF REACH OF CHILDREN
KEEP CONTAINER TIGHTLY CLOSED
NOT FOR INTERNAL CONSUMPTION
CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

LIMITED WARRANTY

All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed.

Cortec Corporation warrants Cortec® products will be free from defects when shipped to customer. Cortec Corporation’s obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer. Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products.

BEFORE USING, USER SHALL DETERMINE THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE, AND USER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION THEREWITH.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO CASE SHALL CORTEC CORPORATION BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Distributed by:

4119 White Bear Parkway, St. Paul, MN  55110  USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
Internet http://www.cortecvci.com

© 2000-2006, Cortec Corporation. All Rights Reserved. Copying of these materials in any form without the written authorization of Cortec Corporation is strictly prohibited.
PRODUCT DESCRIPTION
MilCorr VpCI Shrink Film is a composite film containing the ultimate additives package: Cortec® multimetal Vapor phase Corrosion Inhibitors (VpCI) and UV (ultra violet) inhibitors. MilCorr VpCI Shrink Film provides a top-notch universal protection system.

This product is designed to be an alternative to expensive multi-layer laminated flexible constructions and eliminates the need for vacuum packaging and dehumidification. This film is produced in a standard military tan color.

ADVANTAGES
• Multimetal corrosion protection
• UV Protection
• Flame retardancy
• Extra strength and resistant to puncturing and tearing
• Effective with regular and irregular loads
• High shrink force for broad application
• Can be used for severe weather protection
• Shrink wrap below the pallet not affected by forks
• Provide unitized, tight and pilfer-proof load
• Extra protection for outdoor storage and export shipments
• Six-sided protection is possible
• Effective in severe outdoor climates
• Immediate use of protected object (vehicle, equipment, etc.) upon removal

METALS PROTECTED
MilCorr VpCI Shrink Film is compatible with and protects the following metals:
- Steel
- Iron
- Brass
- Copper
- Solder
- Aluminum
- Silver
- Nickel

For metals not specifically listed above, please contact Cortec for information regarding their protection.

TYPICAL APPLICATIONS
• Military vehicles and equipment preservation
• Mothball preservation of industrial equipment
• Export packaging of expensive larger equipment
• Heavy equipment covers
• Recreational vehicle (boats, snowmobiles, etc.) preservation
• Pallet shrouds

INSTRUCTIONS FOR USE
Shrinking can be performed in a tunnel, in an oven, by lowering a rectangular heating element over the load or by portable heating guns.

• Completely wrap or shroud equipment/vehicle to prevent entry of moisture and air
• Lay out bottom of film in desired storage area
• Place vehicle/equipment on film
• Overlay sheeting a minimum of 1 foot
• Use shrink tape to attach loose ends onto film
• Turn on shrink guns, carefully wave heat fan over film and shrink film to desired fit

Typical shrink temperature range: 340º-440ºF
171º-227ºC

Typical sealing temperature: 240º-320ºF
116º-160ºC
All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed. Cortec Corporation warrants Cortec ® products will be free from defects when shipped to customer. Cortec Corporation’s obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer.

Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products. Before using, user shall determine the suitability of the product for its intended use, and user assumes all risk and liability whatsoever in connection therewith. No representation or recommendation not contained herein shall have any force or effect unless in a written document signed by an officer of Cortec Corporation. The foregoing warranty is exclusive and in lieu of all other warranties, express, implied or statutory, including without limitation any implied warranty of merchantability or of fitness for a particular purpose. In no case shall Cortec Corporation be liable for incidental or consequential damages.

TYPICAL PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TESTING DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (10-mils)</td>
<td>250 microns</td>
</tr>
<tr>
<td>Tensile Strength, psi (ASTM D 302-91)</td>
<td>MD 3431.8</td>
</tr>
<tr>
<td>(ASTM D 302-91)</td>
<td>TD 2049.9</td>
</tr>
<tr>
<td>Elongation, % (ASTM D 302-91)</td>
<td>MD 731.5</td>
</tr>
<tr>
<td></td>
<td>TD 884.7</td>
</tr>
<tr>
<td>Elongation, % Tear Strength, gf (ASTM D 1922-93)</td>
<td>MD 483.4</td>
</tr>
<tr>
<td></td>
<td>TD 2624.0</td>
</tr>
<tr>
<td>Puncture Resistance (ASTM D 3420-95)</td>
<td>325.3 g/mil</td>
</tr>
</tbody>
</table>

MD – Machine Direction
TD – Transverse Direction

For safe handling information, please consult the Material Safety Data Sheet (MSDS).

PACKAGING AND STORAGE

MiCorr VpCI Shrink Film is available in sheeting and tubing form. The film thickness ranges from 10 to 12 mils (250-300 microns).

Please contact Cortec for minimum quantities and specific sizes. Film should be stored indoors at ambient conditions, sealed in original packaging. Under these conditions, shelf life is up to 24 months.

Note: The data contained herein is furnished for information only. One or more United States or foreign patents or patent applications may cover this product.

FOR INDUSTRIAL USE ONLY
KEEP OUT OF REACH OF CHILDREN
NOT FOR INTERNAL CONSUMPTION
CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

LIMITED WARRANTY

All statements, technical information and recommendations contained herein are based on tests Cortec Corporation believes to be reliable, but the accuracy or completeness thereof is not guaranteed.

Cortec Corporation warrants Cortec ® products will be free from defects when shipped to customer. Cortec Corporation’s obligation under this warranty shall be limited to replacement of product that proves to be defective. To obtain replacement product under this warranty, the customer must notify Cortec Corporation of the claimed defect within six months after shipment of product to customer. All freight charges for replacement products shall be paid by customer.

Cortec Corporation shall have no liability for any injury, loss or damage arising out of the use of or the inability to use the products.

Distributed by:

4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone (651) 429-1100, Fax (651) 429-1122
Toll Free (800) 4-CORTEC, E-mail info@cortecvci.com
Internet http://www.CortecVpCI.com

printed on recycled paper, 10% post consumer

Revised 5/2/06, Cortec Corporation 2002-2006. All rights reserved. Supersedes: 9/21/05.
MiCorr® and Cortec® are trademarks of Cortec Corporation
© 2002-2006, Cortec Corporation. All Rights Reserved. Copying of these materials in any form without the written authorization of Cortec Corporation is strictly prohibited.
# Preservation Sealing Tape

## 4811

### Technical Data

<table>
<thead>
<tr>
<th>Product Description</th>
<th>A white polyethylene backing with a unique rubber adhesive that provides excellent performance as an industrial preservation tape.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Construction</strong></td>
<td><strong>Backing</strong></td>
</tr>
<tr>
<td></td>
<td>White polyethylene</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Typical Physical Properties</strong></th>
<th>Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesion to Steel:</td>
<td>30 oz./in. width (36 N/100 mm)</td>
</tr>
<tr>
<td>Tensile Strength:</td>
<td>15 lbs./in. width (260 N/100 mm)</td>
</tr>
<tr>
<td>Elongation at break:</td>
<td>490%</td>
</tr>
<tr>
<td>Backing Thickness:</td>
<td>7.5 mils (0.18 mm)</td>
</tr>
<tr>
<td>Total Tape Thickness:</td>
<td>9.5 mils (0.24 mm)</td>
</tr>
<tr>
<td>Water Vapor Transmission Rate:</td>
<td>3.5g H₂O/m² sq./24 hrs.</td>
</tr>
<tr>
<td>Temperature Use Range:</td>
<td>Upto 170°F (77°C)</td>
</tr>
</tbody>
</table>

| **General Information** | • Effective for many outdoor applications in hot and cold weather over two years with quick, clean removal. |
| | • Can be applied from freezing to 120°F (49°C), removed at 0°F (-18°C). |
| | • May be easily dispensed from the H-128 Hand Dispenser. |

| **Shelf Life** | To obtain best performance, use this product within 18 months from date of manufacture and store under normal conditions of 60° to 80°F (16° to 27°C) and 40 to 60% R.H. in the original carton. |

| **Application Ideas** | • Seals and protects various types of industrial and military equipment in shipment and storage. |
## Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Advantages</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>White polyethylene backing</td>
<td>Good conformability to many irregular surfaces</td>
<td>Helps protect equipment and vehicles during transportation and long-term storage</td>
</tr>
<tr>
<td>Rubber adhesive</td>
<td>Blends well with white film covering</td>
<td>Clean, professional and attractive appearance</td>
</tr>
<tr>
<td></td>
<td>Resistant to hot and cold weather</td>
<td>Effective for most short, medium and long term preservation with quick, clean removal</td>
</tr>
<tr>
<td></td>
<td>Excellent stain resistance to a variety of surfaces</td>
<td></td>
</tr>
</tbody>
</table>

## Technical Information and Data

The technical information and data, recommendations, and other statements provided in this brochure are based on tests or experience which 3M believes to be reliable, but the accuracy or completeness of such information is not guaranteed.

## Product Use

Please remember that many factors can affect the use and performance of a 3M product in a particular application. The materials to be used with the 3M product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given the variety of factors that can affect the use and performance of a 3M product, some of which are uniquely within the user’s knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user’s method of application.

## Limited Warranty and Limited Remedy

The 3M product will be free from defects in material and manufacture for a period of one (1) year from the date of manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user’s method of application. If the 3M product is defective within the warranty period stated above, YOUR EXCLUSIVE REMEDY AND 3M’S SOLE OBLIGATION SHALL BE, AT 3M’S OPTION, TO REPLACE OR REPAIR THE 3M PRODUCT OR REFUND THE PURCHASE PRICE OF THE 3M PRODUCT.

## Limitation of Liability

Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including, but not limited to, contract, warranty, negligence, or strict liability.

This Industrial Tape and Specialties Division product was manufactured under a 3M quality system registered to ISO 9002 standards.
4. NORMS & CERTIFICATIONS

With the aboved mentioned VpCl™ system, a minimum of 3 years of outdoor protection can be achieved while indoor can exceed from 4 to 5 years. In this case, we recommend replacing the emitters installed in the aircraft’s interior.

Esperando que los diferentes puntos que contiene esta oferta merezcan su aprobación, aprovechamos la ocasión para saludarles.

Marcelino Riaza Reyes  
Dpto. Técnico de Corrosión

Rufino Rivas Muñoz  
Jefe Dpto. Técnico

Jesus Orte Crespo  
Jefe Dpto. Técnico de Corrosión
Certification
Awarded To
CORTEC CORPORATION
4119 WHITE BEAR PARKWAY
ST. PAUL, MINNESOTA USA

BVQI (NA), Inc. certifies that the management system of the above organization has been audited and found to be in accordance with the requirements of the management system standards and scope of supply detailed below

STANDARDS

ISO 9001:2000

SCOPE OF SUPPLY

THE DESIGN AND MANUFACTURING OF CORROSION PROTECTION SYSTEMS, METAL CLEANING AND TREATING CHEMICALS, PACKAGING PRODUCTS PROCESS, AND POLYMER ADDITIVES, AND CONCRETE PROTECTION PRODUCTS.

Original Approval Date: 26 MAY 1994

Subject to the continued satisfactory operation of the Organization’s Management System, this certificate will remain valid until: 19 MAY 2009

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization.

Certificate No: 191426
Issue Date: 2 JUNE 2006

For BVQI (NA), Inc.
515 West 5th Street, Jamestown, New York, USA
www.bvqina.com

ANAB ACCREDITED
Certification
Awarded To
CORTEC CORPORATION
4119 WHITE BEAR PARKWAY
ST. PAUL, MINNESOTA, U.S.A.

BVQi (NA), Inc. certifies that the management system of the above organization has been audited and found to be in accordance with the requirements of the management system standards and scope of supply detailed below

STANDARDS

ISO 14001:1996

SCOPE OF SUPPLY

DESIGN AND MANUFACTURE OF CORROSION PROTECTION SYSTEMS, METAL CLEANING AND TREATING CHEMICALS, PACKAGING PRODUCTS AND PROCESS ADDITIVES.

Original Approval Date: 8 MARCH 1998

Subject to the continued satisfactory operation of the Organization’s Management System, this certificate will remain valid until: 8 MARCH 2007

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization.

Certificate No: 153779
Issue Date: 18 MAY 2004

For BVQi (NA), Inc.
515 West 5th Street, Jamestown, New York, USA
www.bvqina.com