CORTEC CORPORATION
Environmentally Safe VCI Technology

4119 White Bear Parkway • St. Paul, MN 55110 USA
(612) 429-1100 • (800) 4-CORTEC • FAX (612) 429-1122

Case Study 1

How do you cut lay-up costs. . .25% ... 50% ... even 75%?

A large processing plant in Texas was going to take a system out of service for two years and then bring it back on line. The system contains a variety of heat exchangers, boilers, vessels and expensive valves.

A substantial reduction in lay-up costs looked attractive. But there were additional considerations -- severe environment, extended exposure, and primarily carbon steel construction.

All the equipment was to be stored outside in weather conditions with very high humidity and severe temperature fluctuations between day and night-for *two years.* With thousands of feet of tubing and interior surfaces in vessels, tanks and valves, effectively stopping corrosion was a major challenge.

How it was done.

The interior of all the equipment (tubes, cavities, void spaces) were fogged with CORTEC® VCI-309 at a rate of 1/2 ounce per cubic foot. They were fogged using a conventional gun and compressed air. It was fast, safe and efficient. VCI action was a great way to protect hard-to-reach interior and recessed areas. After fogging, the openings to all the voids and cavities of the equipment were capped and sealed. Afterwards, the equipment was left outside, uncovered.

VCI protection provided considerable savings. Conventional treatment would have cost 3 to 4 times as much. However, after two years of outside storage would this reduction hold or would reconditioning and re-installation expenses wipe out the initial savings?

The Moment of Truth.

Two years go by. The results? No visible corrosion upon inspection of the equipment. Not even any signs of corrosion in areas where humidity had condensed, and settled as water in low spots. Additionally the CORTEC® VCI-309 Powder helped speed up returning the equipment to operation. The equipment was put into service without unnecessary cleaning.

Can we help you? Just use the reply card, or call **1-800-4-CORTEC.**
CORTEC® Vapor Corrosion Inhibitors may have a new answer for you.

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Case Study 2

How do you avoid failure of relay contacts in corrosive environments?

Considering the reliability of thousands of electronic relay contacts in operation, their individual performance record is noted only when one goes down. It failed not because the contact did not perform to spec. It probably stopped because the contact couldn't withstand the corrosive attack.

Severe corrosion attack may occur infrequently, perhaps only once every few years. Unfortunately, no geographic area is immune. There can be brief periods of intense attack from excessive humidity, industrial gases and outside pollutants.

Not all relay contacts are in a humid coastline environment. But at some time, many relay contacts could be temporarily exposed to this type of climate. Reliability of a relay contact is too important to leave to the corrosive atmospheric conditions in a plant.

These factors illustrate the astute reasoning behind a rather severe test that a major manufacturer of electrical enclosures recently conducted. The test consisted of KUP industrial relays in four electrical enclosures with their covers closed for normal operation. Two enclosures were set as the control sample; the other two contained CORTEC® VCI- 110 Emitters. The four enclosures were then subjected to six weeks of continuous condensing humidity at elevated temperatures (110°F +/43°C +). During this time the relays were constantly powered, cycling over one million times.

At the completion of the test, the contact resistance for each relay was measured. The two enclosures without CORTEC® VCI- 110 Emitters, the contact resistance of the relays increased to over 90,000 OHMS. The relays protected by the CORTEC® VCI-II0 Emitters showed normal contact resistance.

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Case Study 6

How do you ship tubulars across the ocean and store outdoors for 2 years without corrosion?

Combustion Engineering Inc., a major manufacturer of power plant equipment, boiler pipes, etc. was experiencing internal and external corrosion on tubulars shipped to overseas locations. The pipes are typically capped on the ends and external surfaces are coated with shop applied primer. The internal corrosion is attributed to condensation of moisture experienced during shipment from changes in climate, and due to day/night temperature cycles. The "red" primer applied to the external surfaces has limited protection capability of up to 6 months outdoors, and the corrosion is aggravated in the areas of mechanical damage due to shipping and loss of adhesion. Combustion has been searching for a suitable method of protection that would provide both internal and external protection. The additional requirement for any material applied to the *critical* tubing and other components, is that it must be free of any contaminants and should be easily removable from weld areas and during start-up of the plant. In many cases the coating is expected to burn-off from boiler-wall surfaces, but should not form polluting and toxic decomposition products.

After considerable testing and evaluation of commercially available products, Combustion Engineering has selected two Cortec materials for this application:
VCI-368 for external surfaces and VCI-309 for internal surfaces

How it was done.
The exterior of all headers, upper and lower feeder pipes, machined flange surfaces, valves and associated equipment is sprayed evenly with VCI-368 to the dry coating thickness of 3-4 mils (75-100 microns). VCI-368 will air dry at ambient conditions in 30-90 minutes to dry, self-healing film. At this point the equipment and pipes are ready for handling and shipment and the VCI-368 coating will provide protection at points of touching and friction between components, or on metal surfaces in direct contact with wooden pallets or crating.

Results
The results are very positive indicating overall protection after 2 years of outdoor storage. The external surfaces are protected to a large extent, even after shipment across the ocean, and extended storage exposed to high humidity, direct rain, snow and salts. VCI-368 coating does not become brittle or show signs of loss of adhesion, and above all, it is self healing and very effective in protecting metals in corrosive conditions.

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Case Study 10

How to protect heavy equipment during field storage.

1.) Coal shuttle cars returned to storage areas as they were taken out of service. Equipment such as this is usually heavily contaminated with coal residue and excess build-up of grease and oil which tends to pick up airborne dust, etc.

2.) Equipment must be elevated to a suitable height to allow easy access to underbody surfaces.

3.) Larger coal aggregate is removed from hoppers and conveyor chains. High pressure water blasting is carried out to remove surface contaminants.

4.) When all surfaces are cleaned, electrical enclosures are protected by placing a CORTEC VCI device of the correct size in the top of each such enclosure. Units are then sealed.

CORTEC VCI-329 Oil Preservative Inhibitor is then fogged into all oil reservoirs including hydraulics.

Entire exterior surface is then coated with CORTEC VCI-368 Heavy-Duty Inhibitor. Thickness of film will depend on tenure of protection and will vary from 2-5 mils (50 to 125 microns). Areas that are expected to accumulate excess moisture may be treated to a thickness up to double that.

5.) Equipment is left in a ready-to-use condition. Removal of coating is not usually necessary as added corrosion protection will be gained when equipment is returned to service. Driving compartment may be steam cleaned to remove CORTEC VCI-368.

If machinery is to be placed back on the ground, any damage to the coating caused by chains used for lifting should be "touched up" prior to storage.

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Case Study 13

PROBLEM:

How to prevent corrosion from damaging vessel internals and flange faces in storage.

SOLUTION:

A leading Oilfield Exploration & Production Company entrusted the job to **MB Tecserv.**

Two Technicians treated 8 vessels in one day using advanced **Vapor Corrosion Inhibitor Technology.**

Cortec VCI-329 Concentrate was misted into each vessel using a pressurized spray unit -

Flange covers were replaced & secured.

A powerful anti corrosion vapor is released within the vessel which migrates to all recessed areas giving **total internal protection.**

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Case Study 14

PROBLEM:

How to protect complex pipework and vessels against corrosion damage from manufacture to commissioning.

SOLUTION:

MB Tecserv Technicians preserved internal surfaces using the latest Vapor Corrosion Inhibitor technology.

CORTEC® VCI-309 Powder was dispersed throughout the system using a dry fogging technique.

CORTEC® VCI-309 Powder was directed to all sections of the system by systematically opening and closing valves.

CORTEC® VCI-309 generates a powerful anti corrosion vapor within the system which migrates to all recessed areas and protects against corrosion for up to 2 years even with moisture present.

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Case Study 15

PROBLEM:

How to refurbish expensive tube bundles and prevent subsequent deterioration in storage.

SOLUTION:

BP Exploration entrusted the job to Motherwell Bridge.

Each bundle was refurbished by **MB Thermal** and preserved by MB **Tecserv** using advanced Vapor Corrosion Inhibitor Technology. Crates were lined with CORTEC VCI-126 PLASTIC FILM for corrosion and moisture protection.

CORTEC VCI-307 VCI POWDER was fogged into tube internals and over external surfaces before each crate was sealed.

The enclosed atmosphere is conditioned with a powerful anti corrosion vapor which provides total protection for up to 2 years.

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Case Study 16

PROBLEM:

Internal surfaces of pipework are subject to corrosion attack after hydrotesting during shutdown and in storage.

SOLUTION:

MB Tecserv's new application systems provide fast, efficient distribution of CORTEC Vapor Corrosion Inhibitors which give total internal protection for up to 2 years.

A range of VCI Powders and Liquids can now be dispersed effectively throughout small and large bore pipework in straight lengths or complex configurations.

These portable application systems can be hand carried to any location and a simple connection to an L.P. compressed air source makes them operational in minutes.

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Case Study 21

STORAGE
SHUTDOWN
SHIPMENT
MAINTENANCE

PROBLEM:

How to prevent the development of corrosion on pipe internals during shipment to site and avoid expensive clean up costs before commissioning?

SOLUTION:

MB Tecserv developed a protection program in which CORTEC VCI-649 Concentrate is applied by wet fogging immediately after hydrotesting.

This procedure provides total internal corrosion protection for up to 2 years and avoids the need to dispose of large volumes of inhibited water.

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Case Study 22

STORAGE
SHUTDOWN
SHIPMENT
MAINTENANCE

PROBLEM:

How to prevent corrosion from damaging a "Texas Tower" tube bundle during an 8 month storage period.

SOLUTION:

MB Tecserv produced a 3 stage program which provided optimum corrosion protection for both internal and external surfaces.

1) Tube internals were treated with CORTEC VCI-307 Powder Inhibitor which was dry fogged with an MB Tecserv blower.

2) External surfaces were treated with CORTEC VCI-369 Open Atmosphere Inhibitor.

3.) The bundle was protected from the elements with custom made weather proof sheets.

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Case Study 23

STORAGE
SHUTDOWN
SHIPMENT
MAINTENANCE

PROBLEM

How to prevent corrosion from damaging expensive power equipment during a 12 month shutdown in a humid, tropical environment.

SOLUTION:

MB Tecserv developed a program to protect all equipment and systems at Tema Power Station, Ghana.

CORTEC Vapor Corrosion Inhibitors were added to all lubricating oil systems, water cooling systems and fuel oil systems and circulated.

Electrical systems were protected with CORTEC VCI-170 Impregnated Tapes.

Special Wet Fogging techniques were used to enhance protection in fuel oil tanks, pumps, crankcases, turbochargers and exhausts.

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Case Study 25

STORAGE
SHUTDOWN
SHIPMENT
MAINTENANCE

PROBLEM:

How to protect the internal surfaces of pipe systems, pipe spools and vessels against corrosion without introducing liquid inhibitors.

SOLUTION:

CORTEC VCI-309 Powder was applied using a new dry fogging technique developed by MB Tecserv.

The powder was dispersed by an MB Tecserv Blower which ensures fast, efficient distribution throughout the system, providing total internal protection for up to 2 years.

All vents were sealed with proprietary caps to retain CORTEC's protective vapor.

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Case Study 26

STORAGE
SHUTDOWN
SHIPMENT
MAINTENANCE

PROBLEM:

How to ensure that critical motor spares are stored corrosion free and ready for immediate use.

SOLUTION:

MB Tecserv solved the problem by wrapping the rotors in CORTEC VCI-137 Impregnated Foam and then sealing the storage containers.

The vapor mechanism of CORTEC VCI- 137 ensures that all surfaces of the rotors, even recessed areas, are protected for up to 2 years.

This modern approach to corrosion protection is safe, clean and fast, and avoids expensive degreasing and clean up costs before installation.

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