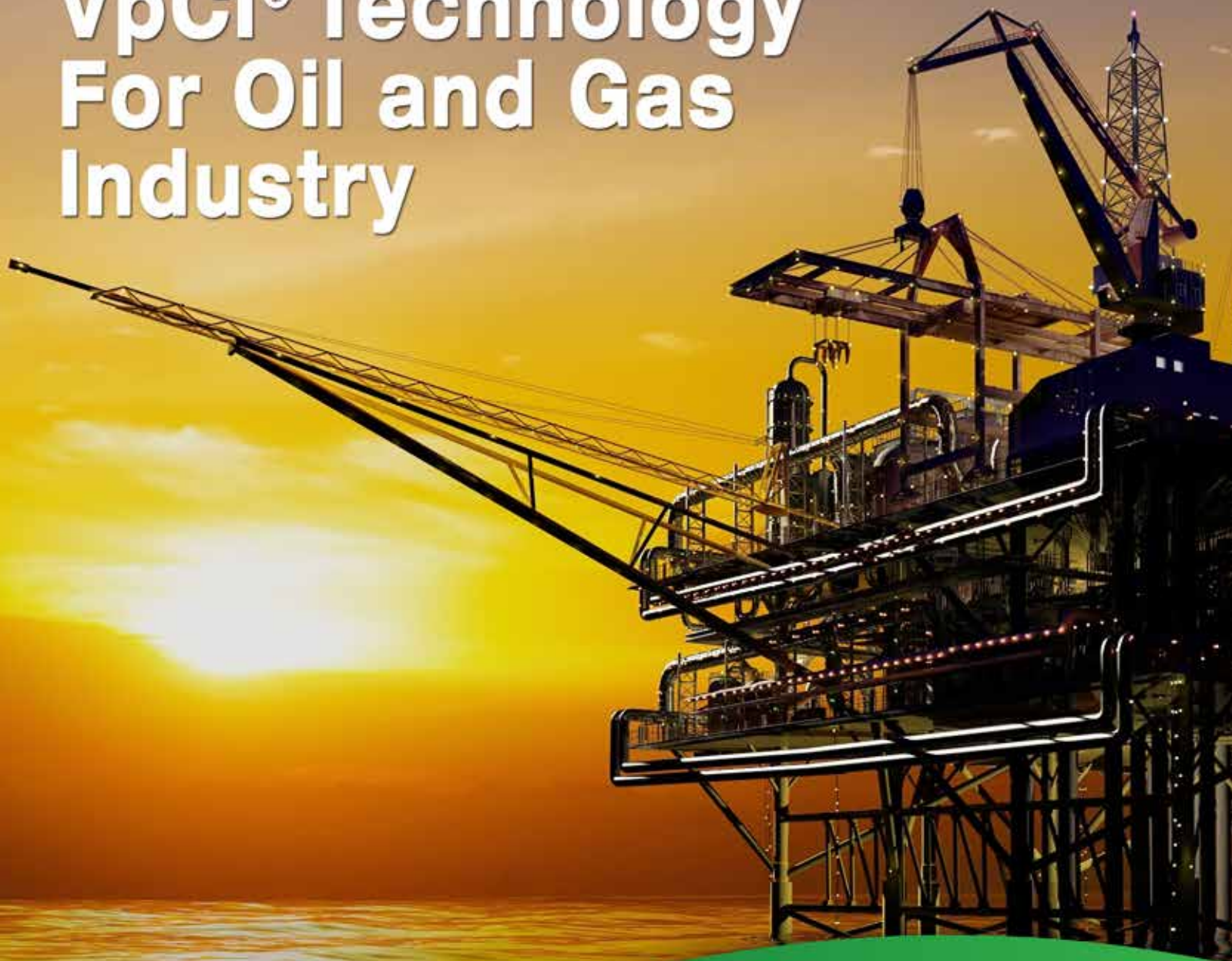




**CORTEC**  
CORPORATION

*Environmentally Safe VpCl®/MCI® Technologies*

# VpCl® Technology For Oil and Gas Industry



# Cortec® VpCI® Technology

## PROTECT OIL & GAS INDUSTRIES

The Oil & Gas Industry has presented difficult challenges to researchers in fighting the effects of corrosion — in economic loss and environmental safety. The total annual cost of corrosion in the oil and gas production industry is estimated to be \$1.372 billion, more specifically \$589 million in surface pipeline and facility costs, \$463 million annually in downhole tubing expenses, and another \$320 million in capital expenditures related to corrosion.<sup>1</sup> Cortec's capability offers highly efficient and economical corrosion protection for Oil and Gas applications. Cortec® products have been developed using proprietary VpCI® Technology. Cortec® VpCIs are a safe, cost-effective method for preventing and diminishing the severe damage caused by corrosive process streams. Utilizing Cortec's corrosion inhibiting products will help companies within the oil and gas industries to comply with safety, health, and environmental policies as well as reduce unplanned maintenance and deferment costs.

## PROTECT THE ENVIRONMENT

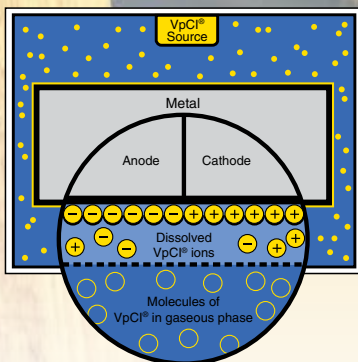
VpCIs offer an environmentally safe method of treatment with low toxicity and low polluting effects. Unlike corrosion inhibiting systems of the past, many of Cortec® VpCI's do not contain chromates or other heavy metals, nitrites, or chlorinated hydrocarbons. With Cortec® VpCIs you can turn the tables on corrosion. With the support of our corrosion scientists, engineers, and testing facility, Cortec® can provide simple, environmentally friendly, cost-effective solutions to corrosion problems.

## PROTECT CONTINUOUSLY

Unlike conventional methods, such as filming amine corrosion inhibitors, you can inject Cortec® VpCIs into any part of your system. Cortec® VpCIs go to work immediately and are self-replenishing. Continuous, uninterrupted protection in the liquid phase, inter-phase, and vapor phase can be added at multiple points. For example, the automatic injection of Cortec® VpCIs into a system — with no attendance operator — provides protection immediately, even on pre-rusted or scaled surfaces.

## Vapor phase Corrosion Inhibitors (VpCI®)

VpCI® technology is an innovative, environmentally safe, cost-effective option for corrosion protection. Cortec® products protect with a thin, mono-molecular protective barrier. The barrier re-heals and self-replenishes, and can be combined with other functional properties for added protective capabilities. VpCI® forms a physical bond on the metal surface creating a barrier layer against aggressive ions.



**Vertical Integration and ISO  
Total Quality to Reduce Risk**

**ISO Accredited Laboratories  
for Validation Testing**

**Trusted Global  
Manufacturing And  
Technical Service in 90+  
Countries**

# Industry Solutions

## PROCESS SYSTEMS—HYDROCARBON SIDE

Crude oil processing equipment, pipes and pipelines, refinery equipment and systems, tankers, and engines need protection against pitting, corrosive gases, and water intrusions.

Cortec® VpCl® Treatments protect systems with a high ratio of residual water, and systems exposed to halogens, sulfide, and hydrogen. These products are especially effective in low areas in the system where water collects causing extreme corrosive attack. Put Cortec® VpCl® to work and let the Cortec® VpCl® alternative solve your corrosion problems.



### Upstream: Exploration & Production

Cortec® provides superior corrosion protection for operational and capital spares, production equipment, infrastructure, key assets, pipeline, vessels, storage tanks, modules, and skids – including flow path, internal and external, operational, and idled assets. Useful during transport, construction, commissioning, operations and maintenance for onshore and offshore assets, Cortec® products and services are environmentally friendly, quarantine compliant, and EHS preferable. Cortec® VpCl® and MCl® solutions for oil/gas ensure readiness and effective maintenance at the lowest possible cost. Sub-sea pipelines, risers, and separators.

### Midstream: Transportation & Storage

Cortec® patented VpCl® technology provides cost effective, easy-to-apply, leave-in suitable solutions for pipeline, storage vessels, transportation vehicles and vessel, and all related capital equipment. Select Cortec® products for flow path (gas, oil, alcohol, steam, fuel, brine, fresh water, salt water), external coatings, internal coatings, and void space including encased pipe, ASTs and as supplements to CP systems. Cortec® also has a range of MRO products that can be used safely in operating conditions.

### Downstream: Refining & Petrochemical

By reducing downtime and extending equipment life, Cortec® products can improve downstream business operation effectiveness and efficiency. Equipment and pipeline failures in oil refining, gas processing, and production facilities create devastating delays. Cortec® products are useful as functional additives in finished petrochemical products, fuels, and byproducts – offering corrosion protection enhancement, especially in moisture and corrosion prone products. Additionally, Cortec products assist in the maintenance, repair, and operations of downstream assets.

## RELATED PRODUCTS/SERVICES

- Permanent Paints
- Soft and Hard Coatings
- Thin Film Inhibitors
- Stabilizers
- CP Mitigation Engineering
- Idle Asset Preservation
- Packaging and Shrouds
- CUI and TOTL Inhibitors
- Additives
- Powders
- Float Coats
- Fogs & Void Space
- Packaging
- Absorption & Scavenging
- Hydrotesting

# Turnkey Corrosion Control

## FIELD SERVICES

In today's diverse and challenging environment, the oil and gas industry increasingly faces reduced human capital availability, elusive efficiency improvements, and increasing reliance on analytic data which can be used to drive real time decision making.

Cortec's field services facilitates the emerging 'digital oil field', providing technology that oil and gas enterprises can rely on to ensure improved efficiency, real time field communications and data collection, and intelligent, responsive decision making.



## Equipment Preservation

Cortec® has provided turnkey support for many years for equipment preservation projects - now we can provide engineering needed through the final application of all preservation technology and products required to effectively mitigate corrosion during downtime.

- This includes preservation during shipment, storage, temporary shut-down, or long-term mothballing.
- Corrosion protection is provided to all surfaces, both internal and external through the multiple delivery systems available with Cortec® VpCl® technologies.
- VpCl® preservation applications include a variety of cleaning products, surface coatings, powders and liquids for fogging of large spaces, additives for lubricants and process liquids, as well as films for total encapsulation.
- With CEFS, real-time corrosion rate monitoring systems for critical assets are available.
- Assistance with removal of preservation products is also available during future equipment recommissioning.

## Plant Layup and Mothballing

Cortec® specializes in turnkey corrosion control engineering and applications services for comprehensive lay-ups of individual units or entire plants. It is augmented with implementation of a comprehensive plant layup package that could include:

- A corrosion audit for identification of all facility corrosion control requirements.
- A comprehensive plan to mitigate internal and external corrosion on all plant assets - both above ground and underground.
- Turnkey application of all corrosion control systems.
- Monitoring and maintenance of corrosion control systems during the layup period.
- Future assistance with the transition from the layup phase to plant commissioning.
- All information can be found at [www.CortecMothballing.com](http://www.CortecMothballing.com)

## Tank, Line & Process Vessel Corrosion Protection

A growing number of Oil & Gas companies are embracing the CorroLogic® System approach for their ASTs. Data from the real-time corrosion rate monitoring equipment that is installed in each tank along with the VpCl®, proves the long term effectiveness of this solution. Cortec® completed a pilot project for the Saudi Arabian Oil Company, Saudi Aramco, on an AST with an oil-sand tank pad at one of their critical Arabian Gulf oil export terminals. Product is used as a powder or string of Corrologic® Emitter powered with Nano VpCl®.

Corrologic® Powder powered with Nano VpCl® is 100% biodegradable in marine environment per OECD\*\*\*306, BOD 28 Marine Test, Non-Toxic, Non-Polluting, and ROHS Compliant. It meets NACE Standard: RP0-087-2000, Military Standard: MIL-I-22110C VIA Test (Vapor Inhibiting Ability).

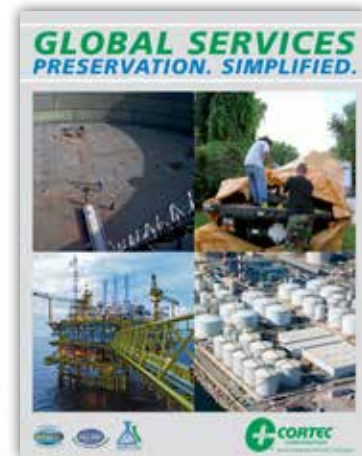
For high temperature applications for tanks holding liquids or solids above 200 deg C use Corrologic® Slurry HT VpCl® System.

## FACILITY AND ASSET PROTECTION WITH GLOBAL SERVICES

# Preservation. Simplified.

Cortec® Global Services provides customers and clients with best-in-class technology, project management, engineering, design, application, and training services to ensure zero defect, low-cost preservation. For over 35 years, Cortec® has delivered high performance turn-key solutions for manufacturers, engineering firms, and project owners from industries ranging from automotive, telecommunications, construction, aerospace, military, power generation, oil and gas, and mining.

By transferring knowledge of best practices between industries, Cortec® can ensure your preservation goals are attained at the lowest possible environmental impact and cost.



## TOTAL SOLUTION PROVIDER

Global Services is focused on providing our customers with optimum corrosion control solutions to meet their everyday needs. The scope for Cortec® Global Services includes a variety of corrosion control design, engineering, and field applications serving Cortec® customers worldwide. Our group is committed to providing a cost effective service designed to ensure our customers receive the correct products, technologies, and applications the first time, every time.

Training and Supervision	Advisory and Consultancy	Engineering and Design (CEFS)	Turnkey Application Services	Laboratory Testing and Product Design
Cortec® Certified Applicator Training	Subject Matter Expert Liaison with Client Engineering	Full Service System Design	Single Purchase Order Full Service Preservation Execution	ISO/IEC 17025 Certified Independent Laboratory
On-the-job-training (OJT) Modular Programs	Application Method and Specification	Corrosion Monitoring and Inspection	Value-Added, Turn-Key Solutions	Technical Specification
Supervision of Client Crews Including Short and Prolonged Deployment	Onsite Liaison: Including Short and Prolonged Deployment	Onsite or Offsite	Assistance Through Entire Project Life-Cycle	Product Design

## BUYER'S GUIDE *Visit our web site for more information on Cortec® Vapor phase Corrosion Inhibitors [CortecVCI.com](http://CortecVCI.com)*

### Certified Applicator Training

Applicator Training - Crew	Cortec® supplied training to provide short-duration training on key asset/task
Applicator Training Individual Certification	Cortec® supplies training services and individually certifies attendees on demonstrated competencies
Applicator Training – OJT Modular	Cortec® provides supervisory training services onsite using OJT modules pertinent to job scope

### Advisory Services

Specification Review	Cortec® supplies SME (subject-matter-expert) remotely or onsite to review and assist in writing or reviewing preservation specifications
Onsite Liaison	Cortec® supplies SME onsite or in back-to-back rotator format or similar in office setting to advise and consult on preservation issues and plan preservation resources
Project Manager	Cortec® supplies PMs for duration of project to plan and execute preservation resources
Scoping Visit	Cortec® supplies Preservation Advisor for initial scoping visits

### Engineering, Design and Monitoring Services

Corrosion Monitoring	Cortec® supplies SME onsite for comprehensive monitoring of all critical components of industrial objects, assets, facilities and plants for signs of corrosion based on project specifications
Corrosion Inspection	Cortec® supplies SME to onsite for inspection of asset integrity and suitability of service. Can also evaluate, design, and implement robust corrosion inspection program
Engineering Design Services	Cortec® supplies a corrosion engineer to build a product and/or process with a specified performance goal
Maintenance Services	Cortec® supplies SME for maintenance of preservation application and projects

### Full Service Preservation Services

Supervisory	Cortec® supplies a Preservation Supervisor to oversee preservation application and/or training of Company crews
Full Crew	Cortec® supplies trained crews to complete preservation projects
Skilled Labor	Cortec® supplies labor to preservation projects to work with Company team

### Laboratory and Corrosion Testing Services

Technical Liaison	Cortec® supplies primary technical expert in the use and application of Cortec® products and preservation methods
Technical Service	Cortec® supplies technical service contact to assist with product and application clarification

# OPERATIONAL CAPITAL ASSETS - BUYER'S GUIDE

PRODUCT	DESCRIPTION	APPLICATIONS	DOSAGE
VpCl <sup>®</sup> -111 Emitter	VpCl <sup>®</sup> -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).	Operating, packaged and stored electrical equipment, marine navigation and communication equipment, aerospace electrical controls, electric motors, switching equipment, fuse boxes, medical equipment, electrical wireways, terminal boxes, scientific and measuring instruments, telecommunications equipment, control panels for manufacturing and processing equipment	1 cup/ 11 ft <sup>3</sup>
BioCorr <sup>®</sup>	BioCorr <sup>®</sup> Rust Preventative is a waterbased, biobased, and biodegradable rust preventative that is intended for preservation of metals in storage and during transportation.	BioCorr <sup>®</sup> Rust Preventative provides multi-metal protection and is an excellent environmentally sound alternative to petroleum derived products.	Apply to surface undiluted. This product has a low viscosity, so the coverage rate is very large.
EcoPouch <sup>™</sup> -308 / VpCl <sup>®</sup> 308 Pouch	EcoPouch <sup>™</sup> contains VpCl <sup>®</sup> -609 powder for corrosion protection of ferrous metals and aluminum.	Tubular structures, pipes, and vessels; internal surfaces of compressors, turbines, engines, tanks, boilers, heat exchangers; steam condensate lines, closed circuit heating, and cooling systems; corrosion protection of equipment after hydrostatic testing; parts, components, and completed assemblies during shipping and storage; voids, cavities, and tanks; double bottom storage tank floors	Each pouch protects up to 1 m <sup>3</sup> (35 ft <sup>3</sup> ).
Desicorr <sup>®</sup> VpCl <sup>®</sup>	Desicorr <sup>®</sup> VpCl <sup>®</sup> is a specially designed two sided pouch which contains a unique combination of desiccant and VpCl <sup>®</sup> (Vapor phase Corrosion Inhibitor).	Desicorr <sup>®</sup> VpCl <sup>®</sup> is designed to protect products, components or assemblies when packaged in corrugated boxes, plastic wrap or bags, and wood or metal containers	One Desicorr VpCl <sup>®</sup> emitter is designed to protect 1 cubic foot. Each Desicorr <sup>®</sup> is able to absorb 1.65 grams of water.
CorPak <sup>®</sup> 1-MUL Pouch	Multifunctional inhibitor pouch with VpCl <sup>®</sup> /desiccant action 2.5" L x 2.5" W x 125" H (6.4 cm x 6.4 cm x 0.3 cm).	Multifunctional inhibitor pouch with VpCl <sup>®</sup> /desiccant action 2.5" L x 2.5" W x 125" H (6.4 cm x 6.4 cm x 0.3 cm)	1.0 ft.3/pouch (0.028 cubic meters).
VpCl <sup>®</sup> -416	Heavy-duty, water-based cleaner/degreaser formulation combined with unique corrosion protection action. Can be metered into power washers, steam cleaners, sprayers and dipping tanks. USDA approved.	VpCl <sup>®</sup> -416 can be applied with any conventional equipment including sprayers, dipping tanks, steam cleaners, and power washers.	Heavy-duty Cleaning and Corrosion Protection: 1 part VpCl <sup>®</sup> -416 to 5-10 parts water. Normal Cleaning (i.e. parts washing): 1 part VpCl <sup>®</sup> -416 to 10-40 parts water. Light Cleaning (i.e. rinsing): 1 part VpCl <sup>®</sup> -416 to 40-150 parts water.
VpCl <sup>®</sup> -418 L	VpCl <sup>®</sup> -418 is a heavy-duty alkaline cleaner/degreaser for cleaning industrial, oil field, commercial and marine equipment.	VpCl <sup>®</sup> -418 is designed for use in power washing machinery, high agitation parts washers and high-pressure spray washers	Light cleaning: Use 2% (by weight) VpCl <sup>®</sup> -418 in water. Normal cleaning: For machinery, rail cars, offshore equipment, and tanks contaminated with medium deposits, use 3% (by weight) VpCl <sup>®</sup> -418 in water. Heavy-duty cleaning: For drilling mud, grease, crude, bilges, concrete surfaces, and structures, use 5-8% (by weight) VpCl <sup>®</sup> -418 in water. Steam cleaning: Use 2% by weight VpCl <sup>®</sup> -418 in water. Temperature range: VpCl <sup>®</sup> -418 is recommended for use in temperatures ranging from 95°-160°F (35°-71°C).
VpCl <sup>®</sup> -329/ VpCl <sup>®</sup> -329D	VpCl <sup>®</sup> -329 is a vapor corrosion inhibiting concentrate for use with lubricating, hydraulic and preservation oils. Provides excellent protection in sheltered outdoor/indoor conditions.	VpCl <sup>®</sup> -329 protects in two unique ways by offering a tenacious film, which clings to metal surfaces, as well as vapor phase inhibitors into the air above the oil. The vapors condense and form a protective barrier on metal surfaces that are not in contact with the oil.	Short-term protection: One part VpCl <sup>®</sup> -329 to 20 parts oil. Medium-term protection: One part VpCl <sup>®</sup> -329 to 10 parts oil. Long-term protection: One part VpCl <sup>®</sup> -329 to 5 parts oil. Storing metal parts: Spray, dip, or brush VpCl <sup>®</sup> -329 onto metal parts before storage.
VpCl <sup>®</sup> -391	VpCl <sup>®</sup> -391 is a water-born, temporary coating that is intended for medium to long-term indoor and outdoor protection	VpCl <sup>®</sup> -391 is recommended for metal surfaces as a protective coating when a non-tacky surface is required and when optimal removability is beneficial	Apply at a rate of 218-545 ft <sup>2</sup> /gal (5.4-13.6 m <sup>2</sup> /L) for a 1-3 mil spread.
MilCorr <sup>®</sup>	MilCorr <sup>®</sup> VpCl <sup>®</sup> Shrink Film is a heavy duty film featuring Cortec multimetal Vapor phase Corrosion Inhibitors (VpCl <sup>®</sup> )	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	Ensure that the metal part is completely wrapped and sealed to provide adequate protection. Large void spaces should additionally be protected with an emitter.
EcoSpray <sup>®</sup> 238 / VpCl <sup>®</sup> -238	EcoSpray <sup>®</sup> 238/ VpCl <sup>®</sup> -238 Electronic Cleaner Excellent contact cleaner of oils, grime and other contaminants. Leaves behind Cortec <sup>®</sup> VpCl <sup>®</sup> corrosion protection.	Cleans and protects without CFCs; Displaces moisture while leaving electrical resistance intact.	Spray evenly across surface to build a thin film (.25-.5 mil) A UV indicator is available to ensure proper coverage.
Electricorr <sup>®</sup> VpCl <sup>®</sup> -239	Electricorr <sup>®</sup> VpCl <sup>®</sup> -239 is a multifunctional outdoor cleaner/corrosion protector	Integrated circuitry, bus bars, outdoor electrical connections	Spray evenly across surface to build a thin film (.25-.5 mil) A UV indicator is available to ensure proper coverage.
VpCl <sup>®</sup> -325	Safe, convenient, ready-to-use vegetable oil/solvent-based liquid for general-purpose corrosion protection.	Some applications include protection of sheet metals, wire, pipes, flanges and other fabricated and/or machined parts, guns and a host of other products.	Apply to surface undiluted. This product has a low viscosity, so the coverage rate is very large.
M-529	M-529 is an oil-based package of corrosion inhibitors for lubricating, hydraulic oils or engine oils.	Corrosion protection for ferrous and non-ferrous metals	M-529 can be dosed at 2-5% for operational protection or preservation.
M-531	M-531 is an oil-based package of corrosion inhibitors for petroleum and synthetic lubricants.	M-531 can be used in a wide variety of industrial lubricant applications where excellent rust protection, filterability, and water resistance are required.	M-531 can be dosed at 2-5% for operational protection or preservation.
VpCl <sup>®</sup> -337	VpCl <sup>®</sup> -337 is a ready-to-use waterborne corrosion inhibitor for temporary protection.	In-process protection; Edge spray of coils and sheet stock; Void spaces; Double wall void spaces; Fogging	VpCl <sup>®</sup> -337 can be fogged into a void space at a rate of 1 oz./ft <sup>3</sup> (1L/m <sup>3</sup> ).
VpCl <sup>®</sup> -705	VpCl <sup>®</sup> -705 Bio is specially formulated for use as a multifunctional fuel additive to biodiesel and other biofuels.	It serves as a corrosion inhibitor, fuel stabilizer, and water emulsifier for biodiesel, diesel, and gasoline.	0.1-0.15% concentration.

# OPERATIONAL CAPITAL ASSETS - BUYER'S GUIDE (Continued)

PRODUCT	DESCRIPTION	APPLICATIONS	DOSAGE
M-640 L	Corrosion inhibiting additive for water and ethylene glycol-based engine heat exchange fluids.	Protects ferrous and nonferrous metals.	2.0-2.5 wt%.
CorShield® VpCI®-369	VpCI®-369 is our best inhibitor for use as an oil additive and/or temporary coating.	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	1-2 mil spread rate. 753-1506 ft <sup>3</sup> /gal at 1-2 mil. 18.8-37.6 m <sup>2</sup> /L at 25-50 microns.
VpCI®-368	VpCI®-368 is a time-proven coating that provides excellent protection to metal substrates exposed to harsh outdoor conditions.	Pipe coating, parts storage, underbody coating, wire rope, steel plate, machined parts.	300-330 ft <sup>2</sup> /gal at 3 mil. 7-8 m <sup>2</sup> /L at 75 micron.
VpCI®-322	Provides corrosion protection to lubricating or hydraulic oils in indoor or open air conditions. Conforms to MIL P-46002B, MIL I-85062, MIL C-16173D (Grade 3), and MIL I-85062.	Corrosion protection to ferrous and non-ferrous metals	Fog: 1 quart/ 35ft <sup>3</sup> (1L/ 1.1M <sup>3</sup> ). Mix: 1 part VpCI®-322 to 9 parts oil.
VpCI®-326	Corrosion inhibitor oil additive for hydraulic oil and gearbox assemblies.	VpCI®-326 is a broad range corrosion inhibitor not only effective on ferrous metals, but also effective on zinc, aluminum, galvanized steel, copper, cadmium, silver, brass, and many other alloys.	Fog: 1oz/ ft <sup>3</sup> (1L/ M <sup>3</sup> ).
VpCI®-126 EMUV Sheeting	Cortec® VpCI®-126 EM UV Film combines high strength resins with ultraviolet light stabilizers (UV) and Vapor phase Corrosion Inhibitor (VpCI®) Technology	This state-of-the-art film construction provides multi-metal protection for parts, equipment, and vehicles for up to three years, even in aggressive outdoor conditions.	Ensure that the metal part is completely wrapped and sealed to provide adequate protection. Large void spaces should additionally be protected with an emitter.
VpCI®-126 EMUV Heat Sealable Bag	Cortec® VpCI®-126 EM UV Film combines high strength resins with ultraviolet light stabilizers (UV) and Vapor phase Corrosion Inhibitor (VpCI®) Technology	This state-of-the-art film construction provides multi-metal protection for parts, equipment, and vehicles for up to three years, even in aggressive outdoor conditions.	Ensure that the metal part is completely in the bag and sealed to provide adequate protection. Large void spaces should additionally be protected with an emitter.
MCI® 2020	Clear MCI® surface treatment for existing concrete. Designed to penetrate and migrate throughout the concrete structure. Patented.	Provides MCI® corrosion protection for rebar in existing structures such as bridges, buildings, garages, decks, and lanais.	Coverage: One coat at 150 ft <sup>2</sup> / gal. Or two coats at 150 ft <sup>2</sup> / half gallon.
MCI®-2018	MCI®-2018 is a silane based concrete sealer, containing time-proven Migrating Corrosion Inhibitors (MCI®)	MCI®-2018 offers a time proven corrosion inhibiting technology that will extend the life of all reinforced concrete structures such as commercial buildings, parking decks, garages, and bridge structures	Coverage: 125-175 ft <sup>2</sup> / gal (3-4.3 m <sup>2</sup> / L).
VpCI® 422	VpCI®-422 effectively removes rust and tarnish from steel, iron, copper, brass, and chrome.	Apply to concrete surfaces to remove rust stains.	Use undiluted. Corrosion removal time varies depending on temperature and stain severity.
VpCI®-423	Effectively removes rust and tarnish from steel, iron, copper, brass and chrome.	Apply to concrete surfaces to remove rust stains.	Apply to surface. Corrosion removal time varies depending on temperature and stain severity.
BioPad®	BioPad® is a unique flexible corrosion inhibiting device constructed from 100% biobased non-woven material, resulting in a finished good containing 66% biobased content.	Metals protected are aluminum, brass, carbon steels, copper, galvanized steel, solder, silver, zinc.	15 ft <sup>3</sup> / ft <sup>2</sup> (4.5m <sup>3</sup> /m <sup>2</sup> ).
VpCI®-126 / HPUV / Shrink	Transparent plastic films with VpCI® for multimetal protection. Heat sealable. Also available in Zip-Lock® bags, and Shrink film varieties with Ultraviolet Protection.	Varies	Ensure that the metal part is completely wrapped and sealed to provide adequate protection. Large void spaces should additionally be protected with an emitter.
VpCI®-609 Powder	VpCI®-609 is a water-soluble Vapor phase Corrosion Inhibiting (VpCI®) powder for wet or dry corrosion protection of ferrous metals and aluminum.	Tubular structures, pipes and vessels; Internal surfaces of compressors, turbines, engines, tanks, boilers, heat exchangers; Steam condensate lines, closed circuit heating and cooling systems; Equipment during and after hydrostatic testing; Parts, components and completed assemblies during shipping and storage; Additive to shot-blasting media, wet blasting; Additive to standing water; Voids, cavities and tanks	300-500 g/ m <sup>3</sup> .
VpCI®-308 Powder	VpCI®-308 is a Vapor Phase Corrosion Inhibitor in powder form for corrosion protection of ferrous and non-ferrous metals in recessed areas, interior cavities and voids.	Bottom plate protection of petroleum storage tanks, tubular structures, pipes and vessels.	300-500 g/ m3.
VpCI®-309 Powder	VpCI®-309 is a Vapor phase Corrosion Inhibitor powder for corrosion protection of ferrous metals in recessed areas, interior cavities and voids.	Tubular structures, pipes, vessels and turbines; Internal surfaces of compressors, turbines, engines, tanks, boilers and heat exchangers; Dry lay-up of closed circuit cooling systems; Equipment protection after hydrostatic testing; Parts, components and completed assemblies during shipping and storage.	300-500 g/ m <sup>3</sup> .
VpCI®-377	VpCI®-377 is a water-based concentrate designed as a complete replacement for oil-based preventives for indoor protection of equipment and components.	Thin film coating for dry storage of: Castings, tubular parts, finished parts, gears; Pumps and housings; Textile and printing equipment; Structural steel, sintered metals; Bars and roll stock; Additive to parts, washers, and rinse water systems; Hydroblasting and hydrotesting	Apply to surface diluted at 5-20% concentration in water. The solution will have a low viscosity, so the coverage rate is very large.

# PROCESS AND FLOW PATH - BUYER'S GUIDE

PRODUCT	DESCRIPTION	APPLICATIONS	DOSAGE
VpCI®-329	Oil-based liquid concentrates that boost corrosion protection of oils.	Lubricating and hydraulic systems, tanks, gear boxes, differentials and surface treatment. Meets MIL-PRF-46002	10% to 20% by v/v depending on length of protection
VpCI®-609®	Powder to protect ferrous metals. Readably soluble in water. Nitrite and chromate free, non-polluting.	Very economical for protecting large enclosures, piping, and hydrotesting. It can be applied dry, by fogging, or added to water.	For dry, fogging, applications apply 0.4 oz. per cubic foot (11grams per 28 liters). For wet applications add 0.25% by weight to the water.
VpCI®-611	Water-based rust preventative concentrate. Leaves a very thin, transparent, tack-free film on the metal surface. Film is weldable and paintable. Non-toxic, and contains no nitrate or phosphate inhibitors.	For water-blasting or wet abrasive blasting. Also for wet lay-up and hydro-testing.	Diluted with water at a 1:10 to 1:20 ratio.
VpCI®-617	Water-based boiler water treatment prevents corrosive attack and harmful insulating deposits.	Boiler systems.	500 ppm.
VpCI®-619	A high temperature protective coating for metal surfaces for use under thermal installation. Product may be applied directly over a tight oxide film or scale.	VpCI®-619 is sprayed or brushed directly to the steel surface. Allow the material to dry up to 60 minutes.	The recommended film thickness is 2-3 mils (50-75 microns) dry with a corresponding coverage of 130-200 sq. ft. (12 - 18.6 m2/l) per gallon.
VpCI®-629	Concentrated additive which forms a persistent barrier for continuous protection in crude oil and other liquid hydrocarbons.	Petroleum process streams (crude oil, products, fuel oils).	5-100 ppm.
VpCI®-637 TOL	Formulated for internal corrosion control in gas flow and gas transmission lines including the difficult Top-of-Line (TOL) corrosion problems.	Designed for use in natural gas pipelines, and petroleum recovery processes, most effective in situations prone to TOL corrosion attacks.	300ml/1,000,000 ft3. 17 liters/million cubic meters.
VpCI®-637	Formulated for internal corrosion control in gas flow and gas transmission lines.	Gas transmission and gathering lines, pipes, pipelines, sub-sea pipelines, hydrate control additive.	300ml/1,000,000 ft3. 17 liters/million cubic meters.
VpCI®-639	High temperature version of VpCI®-629. Rated at 200°C and used up to 600 bar.	Protection for refinery overheads, high temperature oil and gas wells and other environments requiring long term water displacing film formation.	300ml/1,000,000 ft3. 17 liters/million cubic meters.
VpCI®-641	The key hydrotesting and water treatment product for industrial uses.	Protection of partially filled spaces in both vapor and contact inhibitors.	
VpCI®-645	Non-toxic, biodegradable corrosion inhibitor concentrate. Suitable for wet lay-up of boilers as a replacement for hydrazine.	Fresh water, salt water, brine and other highly corrosive solutions containing dissolved sulfides and halogens.	Cooling: 0.25% - 0.75%. Hydrotesting: 50 - 1000 ppm.
VpCI®-646	Ambiodic water treatment system effective against corrosion and scale.	Large industrial cooling systems (open and closed), power plants, refineries, process plants,	Less than 250 ppm.
VpCI®-649/649P	Concentrated additive protects multimetals from corrosive cooling systems.	Deep and hot wells, closed-loop cooling systems and casings.	.05% to 0.1% by v/v
VpCI®-658	Additive for injection into thermal insulation. Formulated for rapid transport of VpCI® throughout the insulating jacket to provide metal pipe protection.	VpCI®-658 is applied by injection into the insulating jacket through either a gravity fed system or a portable injection pump.	Injected at 3-6 month intervals at distances between injection points of 2-20 feet (6 to 6m).
VpCI®-705	Fuel additive to provide corrosion protection for all common engineering metals used in automotive and industrial fuel systems. Approved by General Motors Corporation. #1065180 GMEMD Division.	Recommended for use in gasoline, diesel, gasohol mixtures and alcohol fuels as a corrosion inhibitor, fuel stabilizer and water emulsifier.	0.59 - 1.5% by v/v.
S-5	Wetting agent for aqueous and non-aqueous systems.	Easily added into aqueous and non-aqueous systems in conjunction with Cortec water-soluble and oil-soluble inhibitors.	Between 10 to 5000 ppm.
S-7	Oxygen scavenger designed to protect boiler systems against oxygen corrosion (hydrazine-free).	Applied into boiler systems to stop the corrosive effects of oxygen present in feedwaters.	10 ppm for every 1ppm O2.
S-10/S-10F	Corrosion inhibitor for steam condensate lines in boiler systems.	Injection into steam condensate lines where dissolved carbon dioxide in water forms corrosive carbonic acid.	Less than 100 ppm.
S-11/S110rg/S-11p	Additive for acid systems such as industrial oil field acid cleaning solutions and hot pickling baths.	Added to low pH systems to prevent localized corrosion, especially pitting and hydrogen embrittlement.	0.5% to 1% by v/v.
S-14/S-14bio	General purpose water treatment antiscalant. Non-flammable and non-toxic.	Very effective against scale formation on surfaces in contact with water. S-14Bio is biodegradable version.	Less than 10 ppm.
S-16	Defoamer. Specially selected for use in combination with Cortec water-based and oil-based inhibiting systems. Stable under both acidic and basic conditions. Silicone free.	Defoamer for aqueous and non-aqueous systems.	A starting concentration of 0.3%-0.5% by v/v based on weight.
S-20	Thinner made of water/solvent blend. Used to quickly reduce viscosity of water-based coatings.	Recommend for adjusting the viscosity of VpCI®-374 and VpCI®-386 for spray and dip applications. It can be used for other water-based coatings.	For normal application 5-10% is recommended. Do not exceed 20%.
S-25	Thinner made of a solvent blend. Used to thin solvent-based coating systems.	It is recommended for VpCI®-368 and VpCI®-365 to reduce viscosity for spray and dip applications.	The recommended dosage is 5-10% by v/v.
S-39	Pour point depressant and flow improver.	Fuel additive is intended for use in distillate fuels.	.01% to .05% by v/v.
S-42	Additive to activate or accelerate a rust removing solution. Formulated to extend the life of a VpCI®-422 solution.	Designed for used or new solutions of VpCI®-422 to reactivate and accelerate their performance. For used solutions of VpCI®-422, S-42 is added when the pH of the VpCI®-422 solution has reached 5.0. It will bring the pH down to reactivate the rust remover.	2% for new solutions and 10% by v/v for used solutions.
S-49	Blend of solvents, dispersants, surfactants and emulsifiers for treatment of fuel oil grades #2, #4, #5 and #6.	Fuel oil dispersant/emulsifier that keeps insoluble particles dispersed thus reducing: carbon deposits, soot formations, smoke and particle emission.	1 qt. - 1 gal./1000 gal. 0.95 - 3,785 liters/3785 liters 1% to 10% by v/v.
S-69	All organic water treatment building block (liquid or powder form available).	Designed for low level concentrations which contain a unique combination of contact and vapor phase inhibitors.	1000 - 2000 ppm. for closed loop systems.

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