

Long Term Storage of Ships



Now, more than ever, companies need to protect their capital assets and WIP-cycle components in this time of uncertainty and unplanned shutdowns. Due to the impact of COVID-19, society must embrace the adage, “Hope for the best. Plan for the worst.” Even after this is over, it will take time for the supply and demand sides of the market to synchronize. To ease the process, equipment needs to be protected in such a manner that it can be put back into commission with minimal effort to meet market demand.

Cortec® Corp. is working hard during this crisis to offer help and support across all industry sectors, putting its technical expertise at the disposal of its customers to assist them in the following areas:

- Preservation of laid up vessels
- Preservation of material in inventory

As manufacturing facilities are shutting down and going into a state of forced layup for an indefinite period, keeping these assets corrosion free is essential to ensuring they can be reinstated and operational as quickly and cost-effectively as possible. Corrosion is a major problem for idle equipment and assets, especially in the presence of moist, salt laden air or fluctuating humidity that forms condensation on electrical systems, rotating equipment, hydraulics, bolts, valves, and motors, to name a few components. Corrosion results in

- Premature equipment failure
- Unnecessary and non-budgeted repair and replacement costs
- Costly delays in reinstatement of vehicles, plants, and equipment

How Can We Combat This?

Vapor phase Corrosion Inhibitor Technology is designed to protect assets and equipment during shutdown and storage. It is based on the formation of a molecular barrier that protects ferrous and non-ferrous metal surfaces from oxygen and electrolytes, thus breaking the corrosion cycle. Cortec® VpCI® materials provide total corrosion protection to equipment of all types, from small electronic components to large oil and gas module piping internals.

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Preservation Various Types of Ships

Product Application:

Product	Dosage/Volume Protected
VpCI 101	1 ft ³ (.028 m ³)
VpCI 105	5 ft ³ (.141 m ³)
VpCI 111	10 ft ³ (.311 m ³)
VpCI 308 pouch	35ft ³ (1 m ³)
VpCI 415	10% solution by volume
M531	.5 oz./ft ³ (.52 l/m ³) when fogged and 5% solution by volume when added to oil
VpCI 337	.5 oz./ft ³ (.52 l/m ³)
VpCI 707	.2% by volume
M640L	3% by volume
VpCI 649	.5% by volume
VpCI 645	.75% by volume
VpCI 609	.5 oz./ft ³ (.52 l/m ³)
Boiler Dragon	.5 oz./ft ³ (.52 l/m ³)
Boiler Lizard	1 tube protects 1000 gallons (134 ft ³ , 3.8 m ³)
Boiler Gecko	.5 oz./ft ³ (.52 l/m ³)

Preservation Guideline: (NOTE: Compatibility of all products added to systems should be verified)

Location	Product	Procedure
Guard rails	VpCI 423, VpCI 415, EcoShield 386	Remove rust with VpCI 423, Wash with VpCI 415, Coat with EcoShield 386 clear or color of choice
Decks, bulkheads & hull	VpCI 395, VpCI 384, VpCI 423, VpCI 415	Clean all surfaces for dirt and debris from surface, remove any rust with VpCI 423 and wash/neutralize with VpCI 415. Apply two coats of VpCI 395 and topcoat with VpCI 384
Deck plates/grating	VpCI 423, VpCI 415, VpCI 396, Corverter	Clean all surfaces for dirt and debris from surface, remove any rust with VpCI 423 and wash/neutralize with VpCI 415. OPTION: Instead of using VpCI 423 you can apply CorVerter to the rust which turns the hematite to magnetite which can be painted. Paint with VpCI 396
Electronics and electrical controls	ElectriCorr 239, VpCI 101, VpCI 105, VpCI 111, VpCI 308 pouch	Spray all contacts with ElectriCorr 239, Place the appropriate size emitter into cabinet/panel. VpCI 101, VpCI 105, VpCI 111 and VpCI 308 pouch.
Motors & Generators	ElectriCorr 239, VpCI 105, VpCI 111, VpCI 308 pouch, M531	For open frame motors and generators fog the core with ElectriCorr 239, Place the appropriate size emitter into motor junction boxes. Protect oil system with M531

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Pumps & Compressors	VpCI 337, M531	Fog VpCI 337 into the interior of all pumps, compressors and associated piping except for oil systems. For systems circulating oil, fog the internals with M531. Treat all equipment lubrication systems with M531
Diesel Engines	M640L, M531, VpCI 707, VpCI 371, VpCI 415, VpCI 423	Clean external surfaces with VpCI 415, Remove any rust with VpCI 423, wash/neutralize are with VpCI 415, Coat high temperature sections with VpCI 371 aluminum, Add M640L to cooling system if closed loop, Add VpCI 707 to fuel tank and fog into turbocharger intake, Add M531 to engine oil
Gearbox	VpCI 415, VpCI 423, M531	Clean external surfaces with VpCI 415, remove any rust with VpCI 423, Fog or add M531 to the lubricating oil
Valves	VpCI Super Penetrant, VpCI 369D	Spray all valve stem bushings and packing body nuts with VpCI Super Penetrant. Spray valve steam with VpCI 369D
Oil systems	M531	Add M531 to all lubricating oil systems
Cooling water systems (closed loop)	VpCI 649, VpCI 645	Add VpCI 649 to freshwater systems and VpCI 645 to saltwater systems
Toilets and holding tanks	Eco Sept, Porta-Treat	Add to toilets and holding tanks
Ballast tanks	VpCI 645	Fog and/or add to ballast tank
Void Spaces (Double wall hulls, rudder cavities, etc.)	VpCI 609, VpCI 308	Fog into ferrous only void spaces. Fog VpCI 308 into multi-metal spaces
Storage tanks	M531, VpCI 707	Add M531 to oil storage tanks and VpCI 707 to fuel storage tanks
Hoist and Wenches	VpCI 369D, EcoLine Wire Rope Grease	Spray with VpCI 369D or coat with EcoLine Wire Rope Grease
Hot water boilers (non-potable)	VpCI 649, Boiler Dragon, Boiler Gecko, Boiler Lizard	Wet layup: Add VpCI 649 and circulate through system then drain or leave full. Dry Layup: Boiler Lizard in drained water side, Option to fog Boiler Dragon/Boiler Gecko into water side, Fog Boiler Dragon/Boiler Gecko into the fireside.
Boilers (closed loop, non-potable systems)	Boiler Dragon, Boiler Lizard, Boiler Gecko, M640L	For wet layup add M640L to feed/condensate and circulate. For Dry layup fog Boiler Dragon or Boiler Gecko into both fire side and water side. Boiler Lizard can also be used to protect the drained water side.
Steam Lines	Boiler Dragon	Fog Boiler Dragon into all steam lines
Steam Turbines	VpCI 337, M531, VpCI 415, VpCI 423	Clean external surfaces with VpCI 415, Remove any rust with VpCI 423, Fog steam flow path with VpCI 337,
Gas Turbines	VpCI 337, M531, VpCI 415, VpCI 423, VpCI Super Penetrant	Clean external surfaces with VpCI 415, Remove any rust with VpCI 423, Fog steam flow path with VpCI 337, Spray all external linkages with VpCI Super Penetrant

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Insulation	VpCI 658	Inject into insulation to prevent/control corrosion under insulation
Exposed machined surfaces topside and below decks including aluminum and stainless	VpCI 423, VpCI 415, VpCI 391 clear	Remove any rust with VpCI 423, wash/neutralize with 10% solution VpCI 415 and coat with VpCI 391

Products approved/used by OEMs:

Caterpillar – VpCI 377, VpCI 391
 GE Marine Engines– VpCI 377,
 GE Gas Turbines – M531, VpCI 337GE, VpCI 391, VpCI Super Penetrant, VpCI 377, VpCI 386HT
 Wartsila – VpCI film, BioPad, VpCI 322, VpCI 649, VpCI 645, VpCI powders, VpCI cleaners
 Rolls Royce – VpCI 126 bags
 Fincantieri shipyard – VpCI 609, VpCI 645

Reference Documents:

Marine – Shipbuilding Preservation Brochure

<https://www.cortecvci.com/Publications/Brochures/Marine-Shipbuilding-Brochure.pdf>

Shipbuilding Presentation:

https://corteccorporation-my.sharepoint.com/:b/g/person/jholden_cortecvci_com/ET_X3irDeAZOhFgArEexof4BY6iEZwCysRmA_NgduXcjH8w?e=yftzBA

Certification:




Product	Performance Guideline	QPL Listed	Commercial Equivalent**	NSN/NATO/GSA
Cor-Pak® 1-MUL Pouch	MIL I-22110C		Yes	NSN 6850-01-470-2737 GSA 8030-01-208-1769
Cor-Pak® Tablets*	MIL I-22110C			
CorShield® Packaging Fabric	MIL P-58102		Yes	
Desicorr®	MIL-D-3464E (1)			
Desicorr® VpCI®	MIL-D-3464E (1) MIL I-22110C			
EcoShield®	MIL P-58102		Yes	
EcoWeave®	MIL PRF-121G		Yes	
MilCorr® Shrink Film	MIL PRF-121G		Yes	
VpCI®-101				NSN 6850-01-338-1392
VpCI®-105	MIL I-22110C		Yes	NSN 6850-01-406-2060
VpCI®-110*	MIL I-22110C		Yes	NSN 6850-01-456-2971
VpCI®-111	MIL I-22110C		Yes	NSN 6850-01-408-9025
VpCI®-125				
VpCI-126 Blue®	MIL PRF-22019E (1)		Yes	
VpCI-126® Shrink	MIL PRF-22019E (1)	QPL 22019-21		
VpCI®-130 Series	MIL-PRF-26514G (T 3) (CLS II) (A)			
VpCI®-133	MIL-PRF-26514G (T 3)(CLS II) (A)			NSN 6850-01-426-3539
VpCI®-144	MIL PRF-3420G		Yes	
VpCI®-146*	MIL PRF-3420G		Yes	
VpCI®-150/170	MIL-PRF-26514G (T 3) (CLS II) (A)			NSN 8030-01-208-1769 NATO 8030-00-244-1299
ElectriCorr® VpCI®-238				NSN 6850-01-413-9361

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VpCI®-307	MIL I-22110C		
VpCI®-308	MIL I-22110C		
VpCI®-322	MIL PRF-46002C	Yes	
VpCI®-323	MIL PRF-46002C	Yes	
	MIL I-85062 (Additives to Oils)	Yes	
VpCI®-325	MIL PRF-16173E (3)		NSN 6850-01-517-1652
VpCI®-326	MIL PRF-46002C	Yes	NSN 6850-01-470-3358
	MIL I-85062 (Additives to Oil)	Yes	NATO 6850-66-132-6100
VpCI®-327	MIL C-15074E	Yes	
VpCI®-329	MIL PRF-46002(1)	Yes	NSN 6850-01-470-3359
	MIL I-85062 (Additives to Oil)	Yes	NATO 6850-66-132-6100
VpCI®-347			NATO 6850-66-132-6101
			NATO 6850-66-132-6102
			NSN 6850-01-470-2740
VpCI®-368	MIL PRF-16173E (Grade 1)	Yes	NSN 8030-00-062-6950
			NSN 8030-00-231-2345
			NSN 8030-00-244-1300
			NSN 8030-01-470-2601
			NATO 6850-66-132-5848
			NATO 6850-66-132-6099
VpCI®-368M	MIL PRF-16173E (Grade 1)	QPL 4620-1535(1)	NSN 8030-01-430-4898
VpCI®-369	MIL PRF-16173E (Grade 2)	Yes	NSN 8030-00-244-1297
			NSN 8030-00-244-1295
			NSN 8030-01-149-1731
VpCI®-369M	MIL PRF-16173E (Grade 2)	QPL 4620-1535(2)	NSN 8030-00-244-1298
			NSN 8030-01-149-1731
VpCI®-373			NSN 8010-01-470-2739
VpCI®-377			NSN 8010-01-502-9727
VpCI®-379			NSN 8030-01-481-8928
VpCI®-386 Water Based Acrylic			NSN 8030-01-481-8897
VpCI®-388			NSN 8030-01-481-8898
VpCI®-415	MIL PRF-87937D Type IV BOEING D6-17487 Rev P Douglas CSD-1 AMS-1526B	QPL AFPET/PTPT 09-004 Pending Pending Pending	
VpCI®-422			NSN 6850-01-482-4534
VpCI®-423			NSN 6850-01-482-4536
VpCI®-426 Rust Remover			NSN 6850-01-477-4155
VpCI®-560***Powder	MIL-I-22110C	Yes	NSN 6850-01-470-2738

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Case Histories:




HIGH PERFORMANCE VpCI® PACKAGING




CASE HISTORY


Diesel Engine Preservation

<p>DATE 2014</p> <p>CUSTOMER Man Diesel</p> <p>DISTRIBUTOR Biewu International</p> <p>LOCATION Qatar</p> <p>PRODUCTS VpCI®-368 VpCI®-126</p> <p>PRESENTED BY:</p> <div style="text-align: center;"><p><i>Environmentally Safe VpCI®/MCI® Technologies</i> www.cortec-me.com</p></div>	<p>PROBLEM Man Diesel found that their current engine oils and greases were not effective at preventing corrosion and approached Cortec® to find corrosion prevention solutions for the following equipment:</p> <ul style="list-style-type: none">• Cylinder heads• Cylinder liners• Fuel pumps• Fuel injectors• Piston crowns <p>APPLICATION A Cortec® VpCI® solution was proposed to Man Diesel to effectively mitigate the effects of corrosion upon the sensitive components of their diesel engines in Qatar. Two specific products were identified to mitigate corrosion and prevent damage to the equipment during the temporary storage period:</p> <ul style="list-style-type: none">• VpCI®-368 was surface applied to all external faces.• VpCI®-126 film was used to wrap the assets before being stored. <p>CONCLUSION Man Diesel was happy with the ease of application of the products adopted. Cortec® VpCI® Technology will provide medium to long-term preservation against corrosion while minimizing inspection, costs, and replacement versus traditional methods.</p>
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HIGH PERFORMANCE VpCI® PACKAGING



DATE
January 2016

DISTRIBUTOR
Lake Chemicals

CONTRACTOR
HITEK-nology Solutions

CUSTOMER
V Ships Offshore

LOCATION
Teeside, UK

PRODUCTS
VpCI®-126 HP UV Shrink Film
VpCI®-101, 105, & 111 Emitters
VpCI®-170 Tape
VpCI®-322
VpCI®-337
VpCI®-368 D
VpCI®-369 D
VpCI®-609 S
VpCI®-645
VpCI®-649
CorrVerter®
M 529
CorrLube™ EP Lithium Grease

CASE HISTORY


Drill Ship Preservation

PROBLEM
Customer required their drill ship to be laid up hot, meaning the engines and some equipment would be operational, but the main drilling rig would be preserved and not in use.

APPLICATION

- The risers were treated with VpCI®-337 and the ends sealed with VpCI®-126 HP UV Shrink Film.
- The bulk storage tanks, associated pipe work, and cement mixing tanks were treated with VpCI®-609 S.
- All electric JB's, motors, and monitors both internal and external were treated with VpCI®-101, 105, and 111 Emitters or VpCI®-170 tape.
- All lube oil and hydraulic systems that were to remain in use or with oil in them were treated with M 529, and all empty tanks and systems were treated with VpCI®-322.
- All exposed pistons and operating systems that required lubricating as well as protection from corrosion were treated with VpCI®-369 D.
- All rails and cranes with exposed metal were treated with VpCI®-368 D.
- Any exposed corroded metal where loose metal and rust was visible was cleaned up and treated with VpCI®-368 D.
- All exposed rusted metal that could not be properly cleaned had the loose rust brushed off and treated with CorrVerter®.
- CorrLube™ EP Lithium Grease was used on any area requiring grease.

CONCLUSION
Cortec® products provided a corrosion protection solution to this customer that has resulted in the low cost storage of this high value asset, allowing for quick redeployment when required.



Environmental Safe VpCI®/MCI® Technologies
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SURFACE PREPARATION PRODUCTS

CASE HISTORY

Chemical Tanker Protection



DATE
August 2013

PRODUCTS
VpCI®-369
VpCI®-414

CUSTOMER
3 May Shipyard
Member of Uljanik Grupe

LOCATION
Rijeka, Croatia

PROBLEM
The customer was looking for products for degreasing, cleaning, and protecting metal clamps and nuts inside the ballast tanks of chemical tankers. The ballast tanks have very corrosive environments and require a solution to ensure equipment longevity.

APPLICATION
To clean and degrease the clamps and nuts, VpCI®-414 was diluted and sprayed on the surfaces, then rinsed off with fresh water. VpCI®-369 was then applied to the clamps and nuts to provide superior protection against aggressive corrosion present in ballast tank environments.

CONCLUSION
Cortec® offered the most economical products to meet the customer's corrosion protection requirements. Also, Cortec's products did not require any government permits to be used.



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HIGH PERFORMANCE VpCI® COATINGS

CASE HISTORY

VpCI®-383/VpCI®-415/VpCI®-387/VpCI®-426

DATE

February 2002

CUSTOMER

United States Navy

LOCATION

USS Cole

PROBLEM

Due to the attack on the USS Cole, the ship suffered corrosion out breaks. This application was specialized for the optical objective unit used for targeting. The affected parts were metal to metal with surface corrosion damage.

ENVIRONMENT

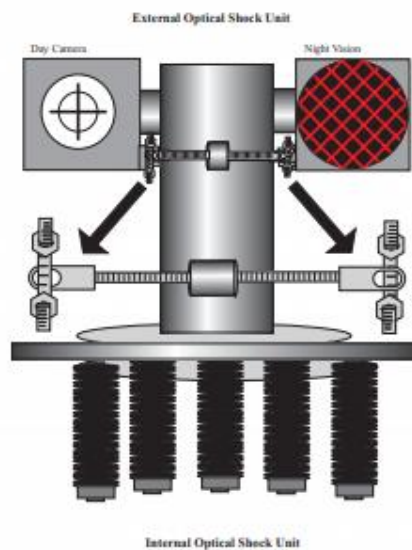
External: High humidity marine
Internal: Climate controlled with salt water damage

APPLICATION

The corroded surfaces were cleaned with the VpCI®-426 rust remover and mechanical brushing, then rinsed with VpCI®-415 spray. The surface was air dried and then coated with VpCI®-383 Water based coating to desired "Wet Film Thickness" allowed to dry and then repeated until desired "Dry Film Thickness" was observed. VpCI®-387 (Gray) is a top coat, used on surfaces needing gray appearance.

REASON CORTEC SELECTED

On-site testing was completed and Cortec's VpCI® products met or exceeded Military requirements for corrosion removal and protection.



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