



REPORT

EPO-CHEM™ RA 500M

SOLVENT-FREE, WET TOLERANT GLASSFLAKE SYSTEM

Marine Industry

July 2018

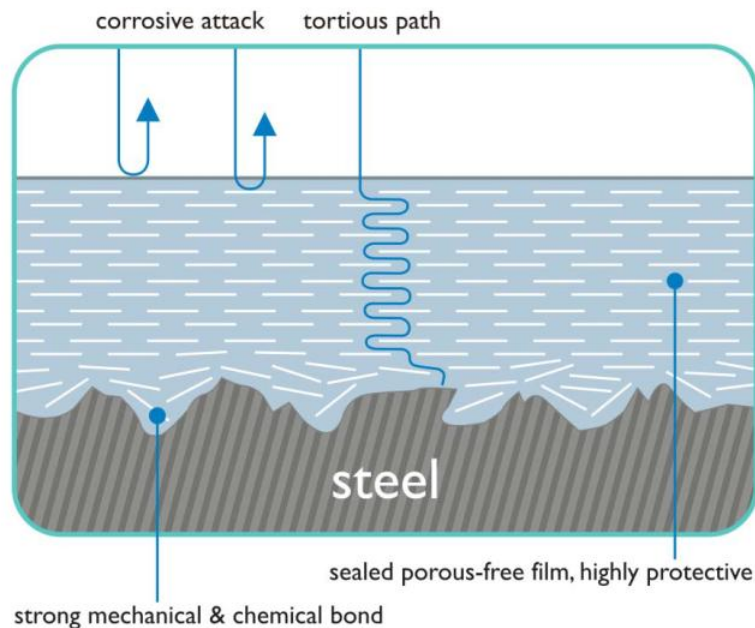
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INTRODUCTION

Epo-chem™ RA 500M is suitable for a wide range of applications, including tanks, vessel linings and deck coatings.

Epo-chem™ RA 500M is a **solvent-free, wet tolerant** and highly chemical resistant epoxy single / topcoat. The glassflake systems have been utilised over the last 30 years as tank lining in the most aggressive environments because they offer total barrier against moisture and corrosive ions. These are typically applied as a one-coat system or as a topcoat on the primers with DFT of 200-300µ. Minimum surface preparation standard required: Sa 2, WJ-2, St 3.



MATERIAL CHARACTERISTICS

- It has been designed to work in damp, humid and poorly ventilated areas that are typically found in ballast tanks
- Used as a stripe coat to repair and protect high corrosion areas, i.e. welds and sharp edges
- Adhesion test results on wet substrates far exceed industry norms attaining over 1300psi before cohesive failure
- **Wet tolerant** - Can be applied on wet and soaking surfaces, no requirement for any dehumidification equipment
- **RA 500M** is 100% solid **solvent-free**, no requirement for any ventilation equipment
Reduces the risk of MIC (Microbiological Induced Corrosion) and SRB (Sulphate Reducing Bacteria) as it does not contain the nutrients contained in solvent-based coatings
- Excellent chemical resistance
- Coating compatible with virtually all coal tar epoxy or other traditional ballast tank coatings
- Compatible with all shop primers
- Unlimited over-coating intervals
- Fast turn-around, can be put back into service almost immediately (as soon as touch dry, 6-12 hours) the system is capable of 'continuing' to cure underwater
- Glassflake technology ensures superb corrosion resistance and a long service life
- Ideal for poorly and hand prepared surfaces - reducing the downtime and back-in service time
- Apply in any environmental condition, no humidity restrictions
- Zero VOC; no fire hazard or odour
- Hot-work, e.g. welding, cutting and grinding can be carried out without interruption
- No storage hazard
- Preparation and application works can be carried out by ships' crew, riding crew, alongside quay-side or in dry-dock
- User friendly

CERTIFICATES AND APPROVALS

- ABS Certificate – RS 500P/RA 500M on bare steel and blast cleaned steel surfaces (Including on wet & rusty steel)
- ABS Certificate – IMO PSPC-COT Approved Oil Cargo Tank Coating
- Lloyds Approval:
 - Lloyds Approval – Ballast Tank Maintenance Coating – **RA 500M**
 - Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare & Shop Primed Steel
- NSF Certificate – Fresh Drinking Water System (when used in conjunction with RS 500P)
- FDA Approval:
 - FDA Approval – Food Contact – **RA 500M**
 - FDA Approval – Potable Water – **RA 500M**

APPLICATION AREAS

- Multi-purpose tank lining: sea water ballast, potable water, grey/black water
 crude oil, refined oil, cargo/grain, mud/brine
- Decks: Internal & External
- Void Spaces & Cofferdams
- Swimming Pools
- Engine Rooms - Bilges/Under Gratings
- Bulkheads
- Rudders
- Topsides/Boottops
- Underwater areas

CASE STUDIES

CASE STUDY 1: Effluent Tank Refurbishment - Navy Vessel



Client: Royal Navy	Industry: Marine
Vessel: Navy Vessel	Date: November 2008
Location: UK	Products: Epo-chem™ RA 500M & RS 500P

Overview
 The Royal Navy required an environmentally friendly coating for one of their vessels in UK and asked Chemco to specify a solution.

Challenge
 The Royal Navy required a fast re-fitting program for their vessel in a UK port. Water, sewage, sea water ballast tanks and ballast bilge areas, along with non-slip deck coatings, had to be carried out in an environmentally friendly way i.e. no grit blasting or solvent-based systems allowed.


Solution
 The only viable solution was to use water jetting as the surface preparation method followed by application of a wet & rust tolerant system. High pressure water wash @ 500 bar was used to remove all contaminants to a WJ4 standard; followed by application of a special primer Epo-chem™ RS 500P solvent-free wet & rust tolerant system @ 100µ and one coat of Epo-chem™ RA 500M solvent-free, wet-tolerant glassflake topcoat @ 200-250µ DFT.


Outcome
 The on time completion of the work was to the total satisfaction of the customer and was passed by all relevant authorities. Due to the ease and the quality of work carried out, subsequent orders from the Royal Navy have materialised. Not only the quality and long-term corrosion protection of the system was significant, but the minimal environmental impact has become of major interest to this and many other shipyards throughout UK; many contracts can now be carried out where it would not have been possible using conventional methods and paints; strict local environmental legislation no longer allows such activities.

Benefits

- Solvent-free
- No grit blasting, ventilation or dehumidification
- Reduced H&S and Fire Precaution
- Reduced cost of plant and equipment
- Application can be carried out in very high humidity or on wet substrate

Continued overleaf





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Photographs:

- Nos. 1-2 Ballast Tank Before and After Application

CASE STUDY 1: Effluent Tank Refurbishment - Navy Vessel (cont.)

<p>3</p>  <p>A wide-angle photograph of a ship's deck. The deck surface is dark and appears heavily stained or dirty. A white ladder is visible in the background.</p>	<p>4</p>  <p>A wide-angle photograph of the same ship's deck after treatment. The deck surface is now a uniform, bright white color, indicating a successful application of the refurbishment product.</p>
<p>5</p>  <p>A close-up photograph of a circular opening in a metal structure. The interior of the void space is heavily corroded, with a thick, yellowish-brown rust coating the walls and floor.</p>	<p>6</p>  <p>A close-up photograph of the same circular opening in the metal structure. The interior surface is now a bright, clean white, showing a significant reduction in corrosion.</p>

Photographs:

- Nos. 3-4 Ship Deck Before and After Application
- Nos. 5-6 Void Space Before and After Application

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 2: Ballast Tanks and Cargo Holds – Dallington Vessel

Case Study



Client: <i>Stephenson Clarke Shipping</i>	Industry: <i>Marine</i>
Vessel: <i>Dallington Bulk Carrier</i>	Date: <i>2005, 2007 & 2010</i>
Location: <i>UK</i>	Product: <i>Epo-chem™ RA 500M</i>

Overview

Stephenson Clarke manage and own a fleet of bulk carriers which require fast re-fitting program to meet with the charterers' requirements. They required a fast refurbishment of ballast tanks and holds in the Dallington in order to retain class.

Challenge

Historically, Stephenson Clarke had utilised solvent-based paint systems for their ballast tanks and cargo holds. Preparation to Sa2.5 by dry-grit blasting and subsequent humidity and temperature controls to maintain ideal painting conditions is both tedious and expensive. This, combined with the strict adherence to re-coating intervals of conventional paints, leads to slow return to service. Stephenson Clarke required an alternative system to fast forward their re-fit programs; based on their experience, they chose the revolutionary Chemco wet-tolerant systems.

Solution

Epo-chem™ 500 Series, solvent-free, wet tolerant, single coat was specified. The preparation was high-pressure wash to WJ-3, followed by application of one coat of Epo-chem™ RA 500M @ 250µ DFT. RA 500M is FDA approved for the carriage of foodstuffs. The same coating was used in the ballast tanks after high-pressure washing (800 bar).

Outcome

A total area of over 10,000m² was coated, ballast tanks were ready in 24 hours and cargo tanks in 72 hours to be put back into service. The total project cost was estimated to be 30% lower than the normal conventional system of grit blasting and painting. Additionally, the vessel was back in service and earning revenue much quicker than it would have been if solvent-based paint had been used due to the reduction in preparation, equipment, staging and de-staging and fast cure of the Chemco system.

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Benefits

- Vessel back in service significantly faster
- Greatly reduced H&S and Fire Precaution
- Vastly reduced environmental impact
 - No grit blasting
 - No requirement for de-humidification
 - No extra ventilation requirements
 - No requirement for heating
- Project cost reduced by 30% versus traditional paints
- Chemco International system will protect the steel substrate in excess of 10 years

Follow up in 2007 & 2010

During re-fit operations in 2007, the Superintendent-in-charge and Lloyds Register's representative inspected the fore-peak and aft-peak tanks which had been coated with Epo-chem™ RA 500M in 2005 and stated that these tanks were in excellent condition. Further inspection in 2010 showed no deterioration (see photographs Nos. 2, 3 and 4 on page 2). No maintenance required from 2005 until 2012 in all areas coated with Epo-chem™ RA 500M.

CASE STUDY 2: Ballast Tanks and Cargo Holds – Dallington Vessel (cont.)

<p>1</p> 	<p>2</p> 
<p>3</p> 	<p>4</p> 

Photographs:

- No. 1 Surface in tank 2005, prior HP Wash
- Nos. 2-4 Tank condition after 5 years

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 3: Ballast Tanks – MISC FPSO

Case Study



Client: <i>Talisman Malaysia</i>	Industry: <i>Marine</i>
Vessel: <i>MISC Bhd.</i>	Date: <i>January 2008</i>
Location: <i>Malaysia</i>	Products: <i>Epo-chem™ RA 500M & RS 500P</i>

Overview

The MISC FPSO required her ballast tanks to be coated in order to achieve class certification. However, the vessel was in constant use and the owners required a solution which did not require dry-grit blasting or involve solvent-based paints due to the risk of explosion and fire. Furthermore, the requirement for a large number of equipment, e.g compressor, dehumidifier etc., would make the contract impractical and expensive. Chemco was approached as the only company that could match the customer's requirements.

Challenge

Preparation of the tanks at sea with high pressure washing and coatings to be carried out in high humidity and on rusty steel. Application of solvent-free coatings capable of application on poorly prepared substrate, some without any profile and with mill scale; and still achieve class certification whilst the vessel is in full production/operation.

Solution

High pressure-wash (800 bar) to remove loose rust and loose mill scale. First/Primer coat and stripe coat was carried out with Epo-chem™ RS 500P solvent-free, wet & rust tolerant system @ 100µ DFT followed by the topcoat with Epo-chem™ RA 500M solvent-free, wet tolerant system @ 250µ DFT.

Outcome

The work was successfully supervised by Chemco Speciality Coatings (SEA), Chemco's subsidiary in Singapore. Class certification was achieved with zero downtime.

Benefits

Chemco was the only company which could provide the solution and did so in a cost-effective manner. The client gained class certification with no loss of production. They were also delighted to receive Chemco's comprehensive guarantee.

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3



Photographs

- No. 1 Talisman on station
- Nos. 2-3 Surfaces ready for coating

CASE STUDY 3: Ballast Tanks – MISC FPSO (cont.)

<p>4</p> 	<p>5</p> 
<p>6</p> 	<p>7</p> 
<p>8</p> 	<p>Photographs</p> <ul style="list-style-type: none"> • Nos. 4-5 Stripe coating with RS 500P • No. 6 Full coat RS 500P • No. 7 RA 500M being applied on wet surface • No. 8 Completed RA 500M topcoat

East Shawhead Industrial Estate
 Coatbridge ML5 4XD
 Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 4: Ballast Tanks – MV Auxis



Client: IBL - Ireland Blyth Ltd	Industry: Marine
Vessel: M/V AUXIS	Date: October 2013
Location: Durban, South Africa	Products: Epo-chem™ RS 500P & RA 500M

Overview

The ballast tanks of the vessel M/V AUXIS required a full refurbishment for over 6,000m² (double bottoms tanks, wings tanks and deep tank) after the original coatings had failed.

Challenge

Some areas of the ballast tanks were heavily corroded with limited access. There was also a very limited time-scale for completion of this project and as a result, grit blasting was not permissible.

Solution

Utilise water jetting as the surface preparation method to WJ-3 standards. Apply one stripe coat of solvent-free, wet & rust tolerant epoxy Epo-chem™ RS 500P followed by one full coat of Epo-chem™ RS 500P @ 200µ DFT. In some localized areas, where most of the existing paint was still adherent, one primer coat of Epo-chem™ RS 500P in all the bare steel areas was applied, followed by one topcoat of solvent-free, wet tolerant epoxy Epo-chem RA 500M applied @ 250µ DFT.

Outcome

The work programme was successfully completed, within the timeframe given and to the satisfaction of all concerned: Owner, Classification Society and Shipyard.

Benefits

- Solvent-free
- Environmentally friendly system (no grit blasting)
- Reduced H&S and fire precautions
- No dew point or humidity restrictions
- No overcoating limitations
- No delays
- No disruption to other on-going work (hot)

Continued overleaf

1



2



Photographs

- No. 1 Deep tank before surface preparation
- No. 2 Wing tank before surface preparation

CASE STUDY 4: Ballast Tanks – MV Auxis (cont.)

<p>3</p> 	<p>4</p> 
<p>5</p> 	<p>6</p> 
<p>7</p> 	<p>Photographs</p> <ul style="list-style-type: none"> • No. 3 Double bottom tank after surface preparation • No. 4 Deep tank after surface preparation • No. 5 Double bottom tank after stripe coat • No. 6 Double bottom tank after full coat. • No. 7 Wing tank after full coat

East Shawhead Industrial Estate
 Coatbridge ML5 4XD
 Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com



CASE STUDY 5: Void Tanks – Surfer Boats



Client: Bourbon Offshore Asia	Industry: Marine
Scope: Void Tanks - Surfer Boats	Date: June & October 2013
Location: Singapore & Indonesia	Products: Epo-chem™ RS 500P & RA 500M

Overview
 The aluminium void tanks onboard Bourbon Offshore Asia's Surfer Boat 2612 & Surfer Boat 2601, required to be refurbished as they were showing signs of deterioration.

Challenge
 Providing a suitable coating system capable of adhering to a aluminium surface. The tanks are located within a very small confined space only accessible by crawling through. Grit blasting and water jetting could not be utilised due to monetary constraints of the client. Working within a tight timeframe also added to the difficulty of this project.

Solution
 The preparation method and the Chemco coating specification was the same for both Surfer boats. Utilise mechanical preparation as the surface preparation method. Apply solvent-free, wet & rust tolerant epoxy Epo-chem™ RS 500P as a primer @ 100µ DFT by roller, followed by a topcoat of solvent-free epoxy Epo-chem™ RA 500M @ 200µ DFT.

Outcome
 This project was carried out on time with no delays. The Chemco system and the speed of the contract was to the satisfaction of all concerned.

Benefits

- Solvent-free
- Chemco system capable of adhering to an aluminium surface
- No humidity or dew point restrictions
- Reduced H&S precautions
- Reduced contract duration
- Reduced cost of plant and equipment

Continued overleaf



CASE STUDY 5: Void Tanks – Surfer Boats (cont.)

<p>3</p> 	<p>4</p> 
<p>5</p> 	<p>6</p> 
<p>7</p> 	<p>8</p> 
<p>Photographs</p> <ul style="list-style-type: none"> • Nos. 3-4 Surfer Boats 2612 & 2601 After Surface Preparation, Respectively • Nos. 5-6 Surfer Boat 2612 After Application of Chemco System • Nos. 7-8 Surfer Boat 2601 After Application of Chemco System 	

East Shawhead Industrial Estate
 Coatbridge ML5 4XD
 Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 6: Swimming Pool Refurbishment – Cruise Ship



Client: Royal Caribbean Cruise Lines	Industry: Marine
Vessel: Cruise Ship	Date: February 2014
Location: Bermuda	Products: Epo-chem™ RS 500P & RA 500M

Overview

The swimming pools on-board Royal Caribbean's cruise vessel had to be refurbished as the existing tile system required regular maintenance and this was causing major problems.

Challenge

Removing the existing tiles and concrete backing to expose the steel. Utilising an alternative surface preparation method to grit blasting, which could not be considered due to problems of excessive dust contamination to the surrounding areas. The client was looking for a system offering a long-term solution which did not require regular maintenance. Working within a strict time-frame also added to the difficulty of this project.

Solution

Both mechanical preparation and water jetting were utilised as the surface preparation methods to St2 and WJ-3 standards respectively. Chemco's solvent-free, wet & rust tolerant primer Epo-chem™ RS 500P was applied followed by two coats of solvent-free, wet tolerant Epo-chem™ RA 500M.

Outcome

The project was completed in 20 days, much quicker than the given time-frame. The quality of the smooth, high gloss finish and the speed of the contract were to the satisfaction of all concerned. The surface preparation method utilised and the unique solvent-free properties of the Chemco system also allowed other work to continue nearby without disruption.

Benefits

- Solvent-free
- No grit blasting
- Reduced down-time and equipment cost
- Wet & rust tolerant properties of the Chemco system
- H&S compliant
- No disruption to other work
- Chemco system offers a long-term and easily repairable solution







Continued overleaf



Photographs

- Nos. 1-2 After Surface Preparation
- No. 3 Topcoat Being Applied on Top of Primer

CASE STUDY 6: Swimming Pool Refurbishment – Cruise Ship (cont.)

<p>4</p>  <p>16.01.2014 07:44</p>	<p>5</p>  <p>16.01.2014 09:33</p>
<p>6</p>  <p>23.01.2014 08:55</p>	<p>7</p>  <p>30.01.2014 15:54</p>
<p>8</p>  <p>30.01.2014 15:56</p>	<p>9</p>  <p>01.02.2014 06:50</p>
<p>Photographs</p> <ul style="list-style-type: none"> • Nos. 4 and 5 First Topcoat Being Applied • No. 6 First Topcoat Complete • Nos. 7 - 9 Completed Application 	

East Shawhead Industrial Estate
 Coatbridge ML5 4XD
 Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 7: New Build (Shop Primer) – Oil Products Tanker

Case Study



Client: <i>Rix Shipping</i>	Industry: <i>Marine</i>
Vessel: <i>Oil Products Tanker</i>	Date: <i>2012</i>
Location: <i>UK</i>	Products: <i>Epo-chem™ RS 500P & RA 500M</i>

Overview

This Oil Products Tanker New Build, required to have the double skin ballast tanks (over 5,000m²) coated with an IMO PSPC approved product. The owners decided that they required a solution which did not require grit blasting or solvent-based paints as the work had to be carried out in confined spaces. Traditionally, shop primers need to be completely removed prior to the application of a coating system. The vessel was visited by its owners and Lloyds as this was the first New Build in the UK that was coated under the new IMO PSPC regulations.

Challenge

To find a coating system which could be applied without the removal of the shop primer and without grit blasting. Working in very tight, confined spaces also added to the difficulty of this project.

Solution

Water jetting (500 bar) was utilised as the surface preparation method to remove any contaminants from the shop primed surfaces and the weld areas were mechanically prepared prior to the application of the IMO Approved Chemco System. One stripe coat of solvent-free, wet & rust tolerant Epo-chem™ RS 500P was then applied, followed by one full coat, both @ 100µ. To complete the system, one topcoat of solvent-free, wet tolerant Epo-chem™ RA 500M was applied @ 250µ.

Outcome

The work was successfully completed and supervised by Baymarine's QA and Chemco's Technical Representative, meeting all the parameters for IMO and Lloyds Register for class certification.

Benefits

- Solvent-free
- No grit blasting
- Wet & rust tolerant properties of Chemco system
- Compatibility with shop primers (IMO Approved)
- Reduced H&S and Fire Precaution
- Substantial time and cost savings

Continued overleaf

1








2



Photographs

- No. 1 Before application
- No. 2 Stripe coating

CASE STUDY 7: New Build (Shop Primer) – Oil Products Tanker (cont.)

<p>3</p> 	<p>4</p> 
<p>5</p> 	<p>6</p> 
<p>7</p> 	<p>Photographs</p> <ul style="list-style-type: none">• Nos. 3-4 During priming• No. 5 Priming complete• Nos. 6-7 Completed application

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com

CASE STUDY 8: Ballast Tanks (Coal-tar Epoxy) – Self Discharging Bulk Carrier

Case Study



Client: <i>V. Ships</i>	Industry: <i>Marine</i>
Vessel: <i>Self Discharging Bulk Carrier</i>	Date: <i>2008 - ongoing project</i>
Location: <i>Poland</i>	Products: <i>Epo-chem™ RS 500P & RA 500M</i>

Overview

The ballast tanks onboard the Self Discharging Bulk Carrier had previously been coated with coal-tar epoxy. Areas within these ballast tanks were now showing signs of corrosion damage and required to be patch repaired.

Challenge

To find a protective coating system which would be compatible with a coal-tar epoxy tank lining.

Solution

Chemco's Epo-chem™ RS 500P (primer) & RA 500M (topcoat) were selected as the protective coating system to be utilised as it is uniquely compatible with coal-tar epoxies. The areas which required the patch repair were mechanically prepared by power tooling to St2 standards. Upon completion of the surface preparation, one coat of solvent-free, wet & rust tolerant Epo-chem™ RS 500P was applied to the prepared areas. This was followed by one topcoat of solvent-free, wet tolerant Epo-chem™ RA 500M.

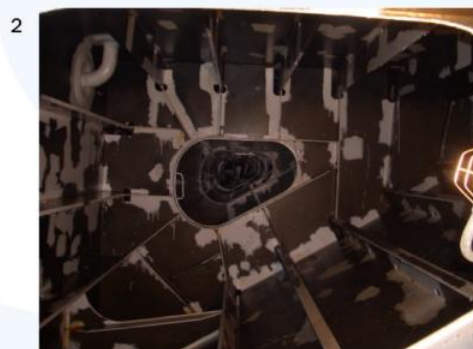
Outcome

The unique characteristics of Epo-chem™ RS 500P allowed the system to be applied with no compatibility issues and with strong adhesion to the coal-tar epoxy. The owners of this vessel are very satisfied with Chemco and issued a letter of recommendation. They also stated that after 5 years the coating is still in perfect condition.

Benefits

- Solvent-free
- No grit blasting
- Rust tolerant properties of Epo-chem™ RS 500P
- Compatibility with coal-tar epoxy
- Reduced H&S and Fire Precaution
- Substantial time and cost savings

Continued overleaf



Photographs

- No. 1 Surface Prepared by Mechanical Preparation
- No. 2 Patch Repair Complete

CASE STUDY 8: Ballast Tanks (Coal-tar Epoxy) – Self Discharging Bulk Carrier (cont.)

<p>3</p> 	<p>4</p> 
<p><u>Photographs</u></p> <ul style="list-style-type: none">Nos. 3-4 Patch Repair Complete	

East Shawhead Industrial Estate
Coatbridge ML5 4XD
Scotland United Kingdom
Tel: +44 (0) 1236 606060
Fax: +44 (0) 1236 606070
Email: sales@chemcoint.com
Web Site: www.chemcoint.com



CASE STUDY 9: Potable Water Tanks – Cruise Vessel



Client: Major Cruise Liner Company	Industry: Marine
Scope: Potable Water Tanks	Date: March 2012
Location: UK	Products: Epo-chem™ RS 500P & RA 500M

Overview

One of the world's largest cruise liner companies required to have the potable water tanks onboard one of their cruise ships refurbished as they were showing signs of age and deterioration.

Challenge

Grit blasting was not permissible. There was also a strict time frame given for completion of the project.

Solution

Water jetting to WJ-3 standards was used as the surface preparation method. This was followed by one primer coat of solvent-free, wet & rust tolerant epoxy Epo-chem™ RS 500P. One topcoat of solvent-free, wet tolerant epoxy Epo-chem™ RA 500M was applied to complete the coating system.

Outcome

The solvent-free properties of the Chemco system and utilising water jetting ensured that there was no disruption to other ongoing work within the vicinity. The unique wet & rust tolerant properties of the Chemco system also ensured that coating application could take place immediately upon completion of the surface preparation, resulting in substantial time and cost savings being achieved.

This system is NSF Certified for potable water applications.

Benefits

- Solvent-free
- Wet & rust tolerant properties
- No grit blasting
- Reduced H&S and Fire Precaution
- Reduced downtime
- Substantial time and cost savings
- No disruption to other ongoing work in the vicinity

1



2



Photographs

- Nos. 1-2 Completed application

APPENDIX 2

AREAS OF A CRUISE SHIP COATED WITH CHEMCO

2.1 Areas of a Cruise Ship Coated with Chemco

THE FOLLOWING IS A COMPREHENSIVE LIST OF SPECIFIC AREAS ON CRUISE VESSELS WHERE CHEMCO COATINGS HAVE BEEN UTILISED:

- Sea Water Ballast Tanks
- Grey Water Tanks
- Sewage Tanks
- Potable Water Tanks
- Fuel Oil Tanks
- Boiler Tanks
- Hot Well Tanks
- Sulphur Fuel Residue Tanks
- Void Spaces
- Battery Rooms
- Fan Rooms
- Chemical Stores
- Steam Pipes (up to 150°C)
- Accommodation Spaces
- Lifeboat Davits - Scuppers
- Chain Lockers
- Food Preparation Rooms
- Firewall Supports
- Sea Inlet Boxes
- Engine Room Bilges
- Machinery Spaces
- Air Con Ducting
- Plenums
- Balconies/Main Decks
- Swimming Pools
- Pool Rooms
- Service Walkways/Passages
- Refrigeration Rooms
- Galleys
- Shower Rooms
- Outside Shell
- Superstructures
- Funnels
- Rudders
- Propellers
- Thrusters Compartments

A lot of the work listed above can be completed in-service, with the technical aspects of the Chemco coatings permitting them to be utilised in areas where most solvent-based systems simply cannot; due to passenger disruption or food/laundry work being in progress.

Equally a lot of the work can be done at refit and allowed to continue despite hot work taking place nearby. Utilising solvent-based systems H&S issues would be a major concern, culminating in long time delays at refits resulting in extensive costs being obtained.

