



REPORT

EPO-CHEM™ RS 500P

SOLVENT-FREE, WET & RUST TOLERANT SYSTEM

Marine Industry

December 2015

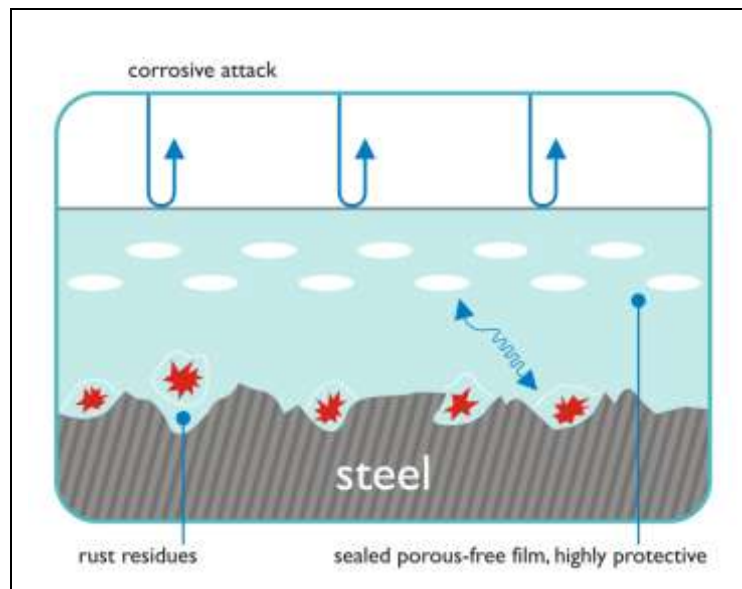
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INTRODUCTION

Epo-chem™ RS 500P is a **solvent-free, wet & rust tolerant** primer or primer-finish epoxy system. The use of special sacrificial fillers enables the system to be applied to surface standards as low as WJ-4, St2.

The system's long-term performance is based on total sealing (porous-free film) and arresting the rust totally. They are typically applied as a 1-coat system which can be over coated by itself or with the topcoat **Epo-chem™ RA 500M**.



MATERIAL CHARACTERISTICS

- Unique, 100% solid **solvent-free, wet & rust tolerant** primer or primer-finish epoxy system
- Flexibility on the surface preparation standards or method, i.e. the most convenient method depending on availability or cost, e.g. grit blast, wet blast, HP water jetting (500-800 bars), UHP or mechanical (St2-St3)
- Apply in any environmental condition, no humidity restrictions
- Ideal for tank lining or confined spaces
- No over-coating limitation
- No requirements for dehumidification, ventilation or heating (substantial cost savings)
- Reduced H&S and Fire Precaution
- Long-term corrosion protection (new MIO-Zinc technology)
- Excellent adhesion to rusty or poorly prepared and wet surfaces (>1200psi)
- One coat (without the topcoat) protects the substrate in excess of 10 years (independent test certificates available)
- Zero VOC, no fire hazard or odour



RS 500P on a sweating and damp surface

CASE STUDIES

CASE STUDY 1: Deck Refurbishment – Aquae

Case Study



Client: <i>Norbulk Shipping</i>	Industry: <i>Marine</i>
Vessel: <i>Aquae</i>	Date: <i>March 2008</i>
Location: <i>Europe</i>	Product: <i>Epo-chem™ RS 500P</i>

Overview

Ship management company, Norbulk Shipping, required a coating with a fast turnaround for their Ro-Ro ferry service from Marseilles to North Africa where carriage of heavy traffic and fast turn-round is vital.

Challenge

The main traffic deck had severely deteriorated due to weathering and heavy traffic. Norbulk Shipping required a system that could be applied with minimum surface preparation, fast drying, high build, and quick cure to enable the refurbishment to be carried out in a very quick time of 48 hours so the ship could return to normal service.

Solution

Norbulk Shipping decided to utilise **Epo-chem™ RS 500P solvent-free, wet & rust-tolerant system** with excellent adhesion to high-pressure washed surfaces, with fast drying/curing properties and good abrasion and impact resistance. One coat of **Epo-chem™ RS 500P @ 200µ DFT** was applied.

Outcome

The client has now taken management of four other Ro-Ro vessels and will utilise the **Chemco** system for all deck traffic areas. This has proven to offer long-term cost-effective, easy to repair by crew and cost effective protection.

Benefits

- Solvent-free
- No blasting required
- Application by crew
- Reduced cost of plant and equipment
- Reduced H&S and Fire Precaution

1



2



Photographs:

- Nos. 1 & 2 Deck traffic areas after application

CASE STUDY 2: Void Spaces, Cofferdams and Ballast Tanks – Arcadia Refit

Case Study



Client: P&O Cruises/Carnival UK	Industry: Marine
Vessel: Arcadia	Date: December 2008
Location: Bremerhaven, Germany	Product: Epo-chem™ RS 500P

Overview

P&O Cruise Lines had already carried out a small trial using Epo-chem™ RS 500P on the 'Artemis' in the engine (difficult access areas of wet and rusty decks under the gratings). Following the successful trials, it was proven that the system met the technical requirements and was specified for follow-up work on the vessel 'Arcadia' whilst on its refit docking program.

Challenge

Traditional solvent-based coatings cause major problems and interruption to the refit program as many different activities by different contractors are being performed on board the vessel. Grit blasting was also considered to be too expensive, time consuming and interruptive to all activities being carried out. As an alternative, with docking time at a premium, the Chemco solvent-free, wet & rust-tolerant system met all the criteria.

Solution

Epo-chem™ RS 500P was ideal for the 'Arcadia' refit docking program. It can be applied on minimum surface preparation (WJ-4/St2), it is solvent-free and completely wet-tolerant. Within two weeks, some 4,000m² was prepared and coated in voids, cofferdams and ballast tanks. Due to the additional benefits of the product, extra work could be undertaken on decks and engine room floor with no interruption to other works being carried out in the vicinity.

Specification

Areas of repair were prepared by high pressure water wash (500-800 bar) to the standard of WJ4. This was followed by one stripe coat and one full coat of Epo-chem™ RS 500P @ 200µ applied by brush, roller or spray.

Continued overleaf



Photographs:

- Nos. 1 & 2 Pipe before and after application
- Nos. 3 & 4 Void space before and after application
- Nos. 5 & 6 Vessel floor before and after

CASE STUDY 2: Void Spaces, Cofferdams and Ballast Tanks – Arcadia Refit (cont.)

Outcome

P&O Cruise Lines were completely satisfied as no downtime occurred due to the technology of the Chemoo product and the results were outstanding. The decision by P&O Cruise Lines technical staff confirmed that Epo-chem™ RS 500P is an environmentally friendly, safe coating offering major cost savings.

Benefits

- Solvent-free
- No grit blasting
- No interruption to all other contractors during refit
- All surface preparation work was carried out by high pressure water wash (500-800 bars)
- Reduced cost of plant and equipment
- No major delays to program
- Application can be carried out in very high humidity or on wet substrate
- Chemoo system will protect the steel substrate in excess of 10 years



- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
- Approved for Contact with Food, Drinking Water & Beverages • Damp or Green Concrete Primers
- Concrete Repair Systems • Elastomeric System
- High Temperature Systems • Fire Retardant • Insulation Systems

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CASE STUDY 3: Ballast Tanks – Harvey H Ward Platform

Case Study



Client: <i>Transocean</i>	Industry: <i>Marine</i>
Vessel: <i>Rig Harvey H Ward</i>	Date: <i>December 2009</i>
Location: <i>Sembawang Shipyard, Singapore</i>	Product: <i>Epo-chem™ RS 500P</i>

Overview

Transocean required to refurbish ballast tanks (over 12,000m²) from a soft coating to a hard coating finish as part of the classification. The application had to be environmentally friendly. Chemco International was able to utilise Epo-chem™ RS 500P solvent-free, wet-tolerant that can be applied without the need of dehumidification equipment making the project more cost effective.

Challenge

Classification Societies are insisting on a measurable DFT on top of steel for corrosion protection. Soft coating to be replaced with hard coating.

Solution

The Shipyard and Transocean were interested in Chemco 500 Series, a system that was 100% environmentally friendly for both the tank cleaning and the subsequent coating system.

Outcome

The tanks were high pressure washed for removal of soft coating. The resulting substrate, and with the high humidity prevailing, Epo-chem™ RS 500P solvent-free, wet & rust tolerant epoxy system was applied in two coats to a DFT of 300µ. Adhesion tests were taken to assure the owners of the excellent adhesion (min 1,200psi) of the system. The system was guaranteed for long-term in-service use.

Benefits

- Solvent-free
- Client approval
- Shipyard work-rate was not affected
- 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
- Chemco International system will protect the steel substrate in excess of 10 years

Continued overleaf

1



2



Photographs:

- No. 1 Ballast tank after UHP washing
- No. 2 Ballast tank after the application of Rusteco Gel
- No. 3 Ballast tank after wash-off UHP
- No. 4 Ballast tank after application of Epo-chem™ RS 500P

CASE STUDY 3: Ballast Tanks – Harvey H Ward Platform (cont.)



- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
- Approved for Contact with Food, Drinking Water & Beverages • Damp or Green Concrete Primers
- Concrete Repair Systems • Elastomeric System
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CASE STUDY 4: Ballast Tanks – MISC FPSO



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.

Continued overleaf



Photographs

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

CASE STUDY 4: Ballast Tanks – MISC FPSO (cont.)



- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
- Approved for Contact with Food, Drinking Water & Beverages • Damp or Green Concrete Primers
- Concrete Repair Systems • Elastomeric System
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CASE STUDY 5: Ballast Tanks – MV Auxis

Case Study



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



Photographs

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

CASE STUDY 5: 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.

- Solvent-free • Water-based • Wet-tolerant
 • Rust-tolerant • Zero VOC
 • Tank & Pipe Linings • Under-water & Marine • Glassflake
 • Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Floor-
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CASE STUDY 6: 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 through crawling. 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 a stainless steel surface
- No humidity or dew point restrictions
- Reduced H&S precautions
- Reduced contract duration
- Reduced cost of plant and equipment

Continued overleaf



Photographs

- Nos. 1 & 2 Surfer boats 2612 & 2601 before surface preparation, respectively
- 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

CASE STUDY 6: Void Tanks – Surfer Boats (cont.)



- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
- Approved for Contact with Food, Drinking Water & Beverages • Damp or Green Concrete Primers
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CASE STUDY 7: Swimming Pools – Navigator of the Seas



Client: <i>Royal Caribbean Cruise Lines</i>	Industry: <i>Marine</i>
Vessel: <i>Navigator of the Seas</i>	Date: <i>February 2014</i>
Location: <i>Bermuda</i>	Products: <i>Epo-chem™ RS 500P & RA 500M</i>

Overview

The swimming pools on-board Royal Caribbean's Navigator of the Seas 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

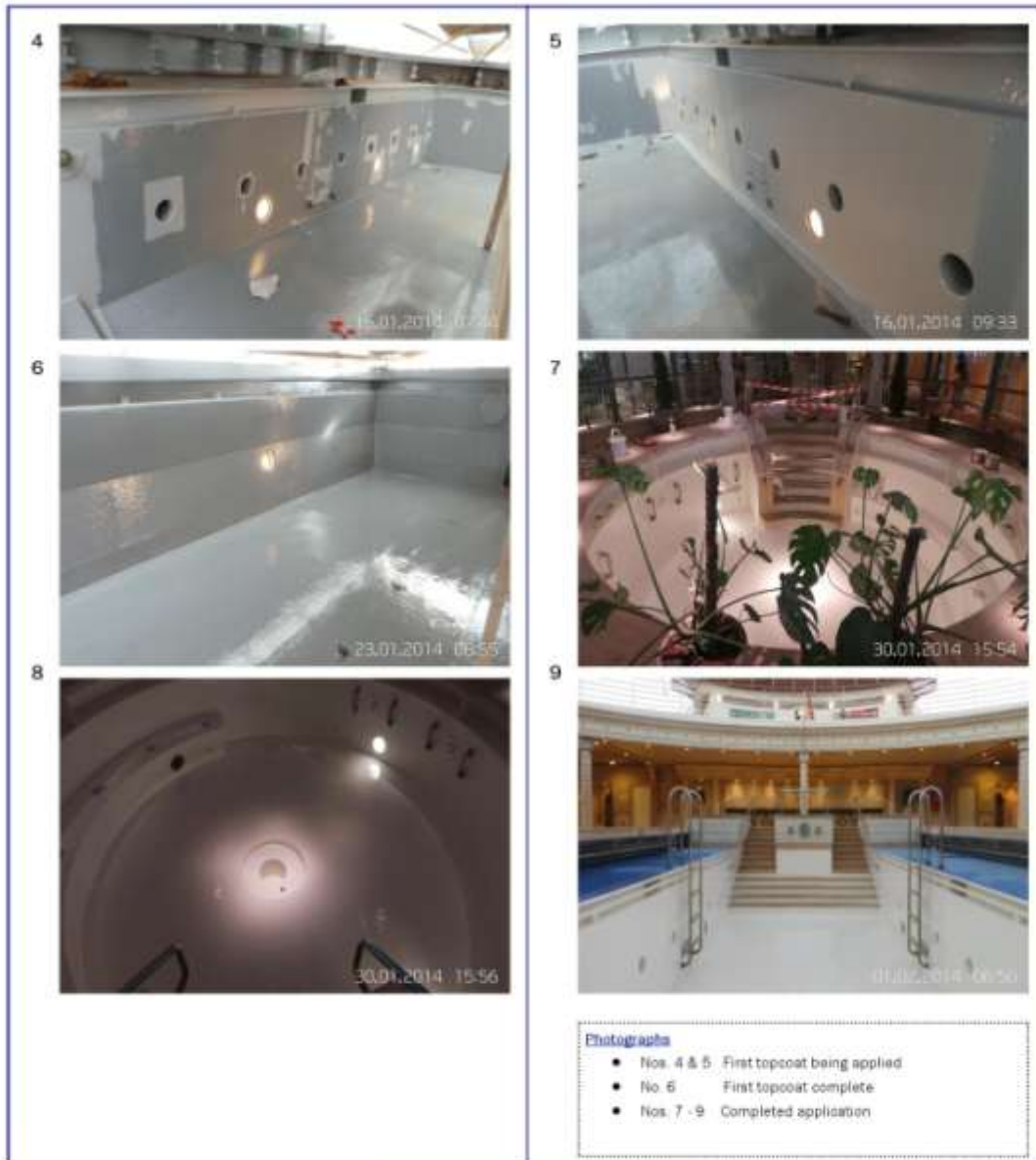
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Photographs

- Nos. 1 & 2 After surface preparation
- No. 3 Topcoat being applied on top of primer

CASE STUDY 7: Swimming Pools – Navigator of the Seas (cont.)



- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
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CASE STUDY 8: New Build (Shop Primer) – MV Lerrix

Case Study



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

Overview

The New Build, MV Lerrix, 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



Photographs

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

CASE STUDY 8: New Build (Shop Primer) – MV Lerrix (cont.)



Photographs

- Nos. 3 & 4 During priming
- No. 5 Priming complete
- Nos 6 & 7 Completed application

- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassfibre
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
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CASE STUDY 9: Ballast Tanks (Coal-tar Epoxy) – Yeoman Bridge



Client: <i>V. Ships</i>	Industry: <i>Marine</i>
Vessel: <i>Yeoman Bridge</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 Yeoman Bridge 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, rust 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

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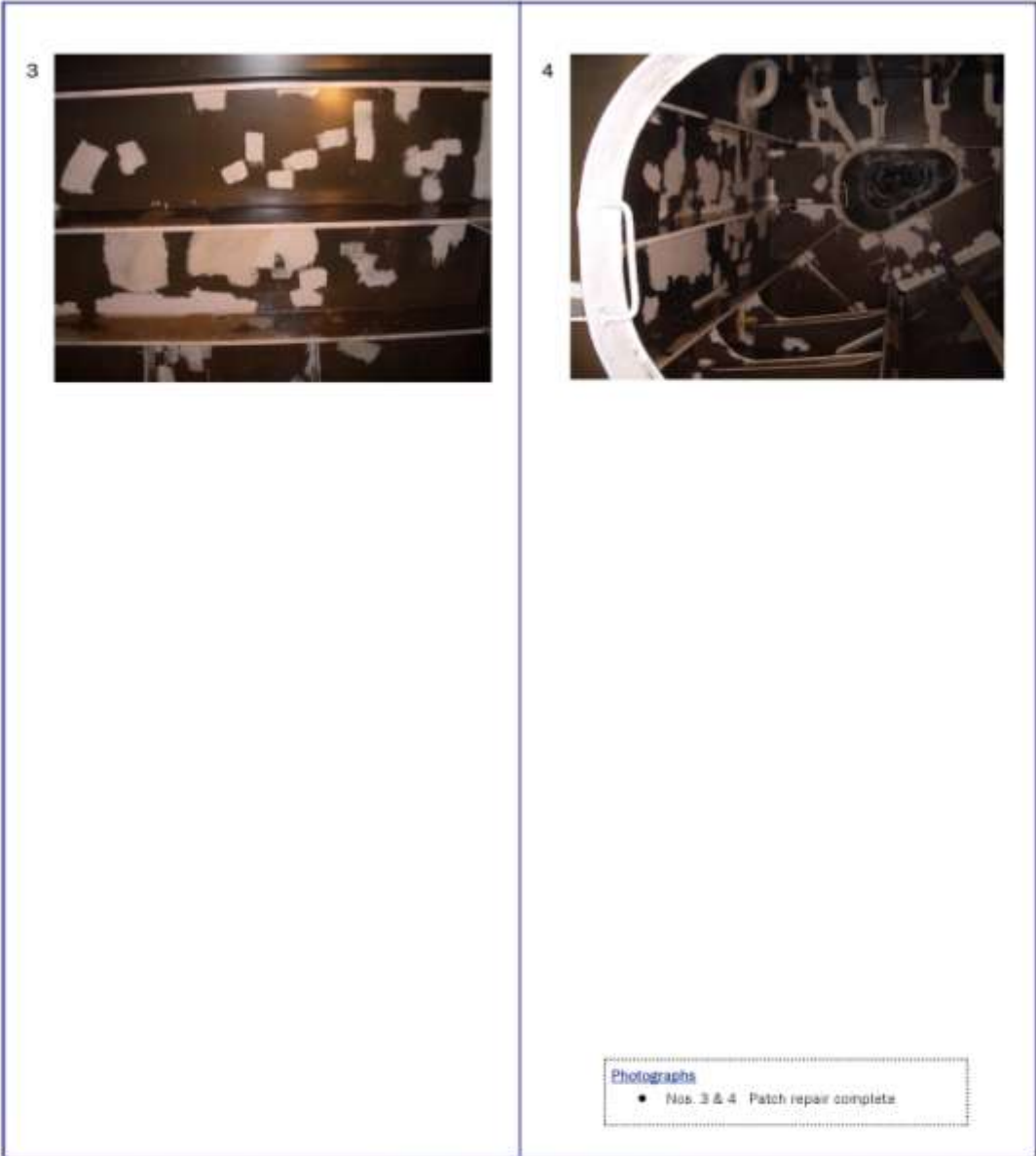
2



Photographs

- No. 1 - Surface prepared by mechanical preparation
- No. 2 - Patch repair complete

CASE STUDY 9: Ballast Tanks (Coal-tar Epoxy) – Yeoman Bridge (cont.)



Photographs
 • Nos. 3 & 4 Patch repair complete.

- Solvent-free • Water-based • Wet-tolerant
- Rust-tolerant • Zero VOC
- Tank & Pipe Linings • Under-water & Marine • Glassflake
- Rust Converters & Primers • Ceramic & Metal Repair • Anti-static, Conductive & Anti-slip Flooring
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CASE STUDY 10: Potable Water Tanks – Cruise Vessel

Case Study



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 1

CERTIFICATES AND APPROVALS

1.1 ABS Certificate – RS 500P/RA 500M on bare steel and blast cleaned steel surfaces
(Including on wet and rusty steel)



CERTIFICATE NUMBER: 14-LD1135810A-PDA-01
DATE: 23 January 2014

ABS TECHNICAL OFFICE
London Engineering Department

CERTIFICATE OF DESIGN ASSESSMENT

This is to Certify that a representative of this Bureau did, at the request of
CHEMCO INTERNATIONAL - SCOTLAND

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

PRODUCT: IMO PSPC Approved Seawater Ballast Tank Coating

MODEL: RS 500P/RA 500M ON BARE STEEL AND BLAST CLEANED STEEL SURFACES.

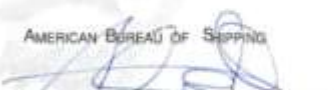
This Product Design Assessment (PDA) Certificate 14-LD1135810A-PDA-01, dated 23/Jan/2014 remains valid until 22/Jan/2019 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

AMERICAN BUREAU OF SHIPPING


Andrew Warrall
Engineer

NOTE: This certificate constitutes compliance with one or more of the Rules, Rules, standards or other criteria of ABS or a statutory, regulatory or contractual requirement. It is issued in full by the use of ABS' assessment, its terms or other authorized criteria. Any significant changes to the documented product or those approved from ABS will result in the certificate becoming null and void. The application certificate is governed by the "Standard Conditions of the Request for Product Type Approval and Assessment" as contained in the ABS Rules.

44258915-0

1.2 RS 500P for Aged Alkyd coatings (Protective Treatment XM92)



This is to certify that

Protective Treatment XM92
For Maintenance Painting of Steelwork with Sound Existing
Aged Alkyd Coatings Not Requiring a Decorative Finish

Supplied by

CHEMCO

Chemco International Ltd
East Shawhead Industrial Estate
Coatbridge
Scotland
ML5 4LY

has been independently tested by

Scientifics Ltd
500 London Road, Derby

and found to satisfy the appropriate requirements of

Network Rail Line Specification RT98

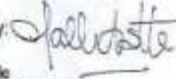
Spot blast-clean to surface standard Sa2½, BS7079, Part A1
Epochem RS500PF (Spot prime, 150µm dft)
Epochem RS500PF (150 µm dft)

Minimum Expected Service Life : 10 Years
(dependent on the standard of surface preparation achieved)
Certificate Expiry Date : 06/06/2008

Certificate No:

XM92/039

Registered Office: 500 London Road, Derby G21 4HQ
Telephone: 01332 264411 Fax: 01332 263286
<http://www.scientifics.co.uk> email: info@scientifics.co.uk

Authorised by: 
Malcolm Astle
Team Leader, Coatings
Date: 06/06/2008

1.3 RS 500P for New or Weathered Galvanised Steel (Protective Treatment X099)



This is to certify that

Protective Treatment X099
For New or Weathered Galvanized Steelwork
Not Requiring a Decorative Finish

Supplied by

CHEMCO

Chemco International Ltd.
East Shawhead Industrial Estate
Coatbridge
Scotland
ML5 4LY

has been independently tested by

Scientifics Ltd
500 London Road, Derby

and found to satisfy the appropriate requirements of

Network Rail Line Specification RT98

Epochem RS500PF (Stripe coat 150µm dft)
Epochem RS500PF (150 µm dft)

Minimum Expected Service Life : 10 Years
(dependent on the standard of surface preparation achieved)
Certificate Expiry Date : 06/06/2008

Certificate No:

X099/011

Authorised by: 

Malcolm Astle
Team Leader, Coatings

Date: 06/06/2008.

Registered Office 106 London Road, Derby DE1 3BQ
Telephone: 01332 244018 Fax: 01332 241386
<http://www.scientifics.com> email: info@scientifics.com

04A

1.4 Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare Steel



Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: MNDE/2011/4217

Page 1 of 2

This is to certify that the protective coating system manufactured at the plant below is in compliance with IMO Resolution MSC.215(82) *Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (PSPC)* adopted on 8th December 2006.

This approval is granted in accordance with the PSPC, IACS Regulations and LR Rules. The surface preparation and application requirements specified in the product technical data sheet (PTDS) have been reviewed and comply with the PSPC. This approval does not cover properties other than corrosion prevention, such as service life, safety or toxicity etc.

The approval is subject to Lloyd's Register being informed of any changes in the product's formulation, specification or status of manufacturing quality control accreditation. Periodic auditing of the manufacturer's quality control and assurance systems will confirm compliance. Lloyd's Register reserves the right to withdraw or re-issue this certificate.

Manufacturer: **Chemco International Ltd.**
East Shawhead Industrial Estate,
Coatbridge,
Scotland,
United Kingdom

Coating system: **Epo-chem™ RS 500P / Epo-chem™ RA 500M**

Product codes: **RS 500P / RA 500M**

Curing agents: **HR 500P / HF 500M**

Applications **Water ballast tanks and double-side skin spaces**

Notes:

1. Surface preparation and coating application should be carried out in accordance with the manufacturer's PTDS.
2. Product approved for use with the compatible shop primers listed on page 2, or on clean blasted bare steel.

Date of issue: **26 May 2011**

Date of expiry: **1 June 2016**

Richard Dawson
Surveyor to Lloyd's Register EMEA
A member of Lloyd's Register Group

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Issue No. 1

1.4 Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare Steel (cont.)



**Protective Coatings for Water Ballast Tanks
and Double-side Skin Spaces**

Certificate No: MNDE/2011/4217

Page 2 of 2

Compatible Shop Primers:

Primer

Product Code(s)

Manufacturer

Bare steel only

End of list

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Issue No. 1



Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: **MNDE/2011/4217**

Page 1 of 2

This is to certify that the protective coating system manufactured at the plant below is in compliance with IMO Resolution MSC.215(82) *Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (PSPC)* adopted on 8th December 2006.

This approval is granted in accordance with the PSPC, IACS Regulations and LR Rules. The surface preparation and application requirements specified in the product technical data sheet (PTDS) have been reviewed and comply with the PSPC. This approval does not cover properties other than corrosion prevention, such as service life, safety or toxicity etc.

The approval is subject to Lloyd's Register being informed of any changes in the product's formulation, specification or status of manufacturing quality control accreditation. Periodic auditing of the manufacturer's quality control and assurance systems will confirm compliance. Lloyd's Register reserves the right to withdraw or re-issue this certificate.

Manufacturer: **Chemco International Ltd.**
East Shawhead Industrial Estate,
Coatbridge,
Scotland,
United Kingdom

Coating system: **Epo-chem™ RS 500P / Epo-chem™ RA 500M**

Product codes: **RS 500P / RA 500M**

Curing agents: **HR 500P / HF 500M**

Applications **Water ballast tanks and double-side skin spaces**

Notes:

1. Surface preparation and coating application should be carried out in accordance with the manufacturer's PTDS.
2. Product approved for use with the compatible shop primers listed on page 2, or on clean blasted bare steel.

Date of issue: **17 January 2012**

Date of expiry: **1 June 2016**

A handwritten signature in black ink, appearing to read 'RD'.

Richard Dawson
Surveyor to Lloyd's Register EMEA
A member of Lloyd's Register Group

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Issue No. 2

1.5 Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Shop Primer (cont.)



Protective Coatings for Water Ballast Tanks and Double-side Skin Spaces

Certificate No: MNDE/2011/4217

Page 2 of 2

Compatible Shop Primers:

<u>Primer</u>	<u>Product Code(s)</u>	<u>Manufacturer</u>
Interplate 937	NQA933, NQA934, NQA936	International Paint Ltd.
Sigmaweld 190	179171, 179172	PPG Protective & Marine Coatings
Cerabond 2000	N/A	Chugoku Marine Paints, Ltd.
Nippon Ceramo (<i>Nippe Ceramo</i>)	N/A	Nippon Paint Marine Coatings Co., Ltd.

End of list

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Issue No. 2

1.6 Lloyds Approval – Ballast Tank Maintenance Coating – RS 500P

In the event of any conflict or ambiguity between this printout and the original electronic document, the electronic document shall prevail.



RECOGNISED BALLAST TANK MAINTENANCE COATING

Certificate No. MATS/3838/3

This certificate is issued to the company named below. The ballast tank maintenance coating described has been recognised for use in constructions built under Lloyd's Register survey. This recognition is subject to Lloyd's Register being informed of any changes in or modifications to the coating and the product being used in accordance with the manufacturer's instructions and with the relevant requirements of Lloyd's Register's Rules and Regulations.

Company	CHEMCO INTERNATIONAL LTD. UNITED KINGDOM
Trade name	EPO-CHEM RS 500P
Class	CLASS 1
Coating Type	EPOXY
Number of Coats	1*
Coating Thickness	200 microns
Remarks	<p>* Additional stripe coat to be applied to welds, edges and section changes.</p> <p>Maintenance of dedicated seawater ballast tanks on vessels compliant with MSC.215(82) "Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-Side Skin Spaces of Bulk Carriers" shall be performed in accordance with IMO MSC.1/Circ.1330 "Guidelines for Maintenance and Repair of Protective Coatings"</p>

Valid until 18 May 2020

Date 21 May 2015

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A handwritten signature in blue ink, appearing to read 'Stuart Downie', is written over a horizontal line.

Stuart Downie
Senior Surveyor to Lloyd's Register EMEA
A member of the Lloyd's Register group

1.7 NSF Certificate: Fresh Drinking Water System (when used in conjunction with RA 500M)

NSF International

789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Chemco International Ltd
Facility: Coatbridge, United Kingdom

AS COMPLYING WITH NSF/ANSI 61 AND ALL APPLICABLE REQUIREMENTS.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.



ANSI Accredited Program
PRODUCT CERTIFICATION
2014
Certification Program
Accredited by the
American National
Standards Institute



Certification Program
Accredited by the
Standards Council
of Canada

This certificate is the property of NSF International and must be returned upon request. For the most current and complete information, please access NSF's website (www.nsf.org).

September 26, 2014
Certificate# C0184107 - 01

A handwritten signature in black ink, appearing to read "D. Purkiss".

David Purkiss
General Manager, Water Systems

1.7 NSF Certificate: Fresh Drinking Water System (when used in conjunction with RA 500M) (cont.)



OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

This is the Official Listing recorded on September 28, 2014.

Chemco International Ltd
13-23 Hagmill Road
East Shawhead Industrial Estate
Coatbridge ML5 4XD
United Kingdom
+44 1236 606060

Facility: Coatbridge, United Kingdom

Trade Designation	Protective (Barrier) Materials		Water Contact Temp	Water Contact Material
	Water Contact	Size Restriction		
[1] 123 (G) Tanks				
Epo-Chem EA 500	=>	1000 gal.	CLD 23	EPOXY
Epo-Chem EA 500 (M)	=>	1000 gal.	CLD 23	EPOXY
Epo-Chem EA 500M	=>	1000 gal.	CLD 23	EPOXY

- [1] All RA500 products are used with Epo-Chem EB 500F primer.
- [2] Colors: <only capitalize the first color, put the colors in alpha order>
 Number of Coats: Primer 1, Top Coat 1
 Maximum Field Use Dry Film Thickness (in mils): Primer: 10; Top coat: 25; Total system: 35
 Maximum Thinner: 5% TS Thinner
 Recoat Cure Time and Temperature: Primer cure time is 2 hours at 30°C
 Final Cure Time and Temperature: 48 hours at 30°C
 Special Comments: Primer: Mix Ratio is 4.18:0.82 (Part A:Part B) by weight Top Coat: Mix Ratio is 3.67:1.333 (Part A:Part B) by weight
- [3] Product is Certified to NSF/ANSI 372 and conforms with the lead content requirements for "lead free" plumbing as defined by California, Vermont, Maryland, and Louisiana state laws and the U.S. Safe Drinking Water Act.

Note: Additions shall not be made to this document without prior evaluation and acceptance by NSF International.

1 of 1

799 N. Zeebree Road, Ann Arbor, Michigan 48105-9723 U.S.A.
 1-800-NSF-MARK / 734-769-8010
www.nsf.org

C0184103

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
- Void Spaces
- Battery Rooms
- Fan Rooms
- Chemical Stores
- Steam Pipes (up to 150 °C)
- Accommodation Spaces
- Lifeboat Davits - Scuppers
- Chain Lockers
- 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



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.

APPENDIX 3

TEST REPORTS

3.1 Long-Term Condition Test for Wet Substrates



Report No: COA/01515
Issue Date: 28th April 2003

Test Report:
Evaluation of
Epochem
RS500 and
RL500 Coating
Systems
Applied in Wet
Conditions

Authorised by: A. Gascoyne
A Gascoyne
Coatings & Corrosion Technologist

Prepared by:
A Gascoyne
Scientifics Ltd
500 London Road
Derby
DE24 8BQ

Prepared for:
Mark O'Hanlon
Chemco International Ltd
East Shawhead Industrial
Estate
Coatbridge
Scotland
ML5 4LY

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Issued by Scientifics Limited, 500 London Road, Derby DE24 8BQ.

COA01515/MSU3629 -1 Page 1 of 3

3.1 Long-Term Condition Test for Wet Substrates (cont.)



Epo-chem RL500PF: Applied to Wet Aged Alkyd (Test Panels: 021729A).
Dfts ranging from: 108 – 141 µm

Test	Result									
Application & Appearance	<p>Application: Intermittent 'skidding' of the brush over the wet surface. Presence of water adversely affected the paint substance finish (see appearance).</p> <p>Appearance: Generally satisfactory, but with elongated areas of water-affected paintwork (locally thin film).</p>									
Cross-cut adhesion test, BS3900: Part E6: 1992	Classification 0 result, triplicate determination with 3mm spacing.									
Pull-off adhesion, ASTM D4541	All three tests gave pull-off adhesion values greater than 1000 psi.									
Resistance to impact, BS3900: Part E7	No defects evident in the coating system, including cracking, flaking or detachment from the substrate.									
Resistance to humidity, BS3900: Part F2: 1973	Panels inspected after 2000 hours exposure. No signs of softening, swelling, blistering or underfilm corrosion were evident.									
Resistance to Salt Spray, BS3900: Part F12: 1997	After 2000 hours exposure, rusting and rust staining was recorded at the parallel scratches, but no undercutting present. No breakdown was noted on the remainder of the panel.									
Resistance to UV/Condensation, BS3900: Part F16: 1997	<p>No signs of cracking, flaking, blistering or loss of substrate adhesion were evident after 1000 or 2000 hours, however, slight chalking was evident after 1000 and 2000 hours exposure. Changes in colour (CMC(2:1) colour difference equation) and gloss are detailed below:</p> <table border="1"> <thead> <tr> <th>Exposure Period</th> <th>Colour Change ΔE</th> <th>Change in gloss 60° Head</th> </tr> </thead> <tbody> <tr> <td>1000 hours</td> <td>2.04</td> <td>-2 G.U. (3 to 1)</td> </tr> <tr> <td>2000 hours</td> <td>3.15</td> <td>-2 G.U. (3 to 1)</td> </tr> </tbody> </table>	Exposure Period	Colour Change ΔE	Change in gloss 60° Head	1000 hours	2.04	-2 G.U. (3 to 1)	2000 hours	3.15	-2 G.U. (3 to 1)
Exposure Period	Colour Change ΔE	Change in gloss 60° Head								
1000 hours	2.04	-2 G.U. (3 to 1)								
2000 hours	3.15	-2 G.U. (3 to 1)								


3.1 Long-Term Condition Test for Wet Substrates (cont.)



Epo-chem RS500PF: Applied to Wet Aged Alkyd (Test Panels: 021733A).
Dfts ranging from: 130 - 152µm

Test	Result									
Application & Appearance	<p>Application: Intermittent 'skidding' of the brush over the wet surface.</p> <p>Appearance: Generally satisfactory, but with elongated areas of water-affected paintwork (locally thin film).</p>									
Cross-cut adhesion test, BS3900: Part E6: 1992	Classification 0 result, triplicate determination with 3mm spacing.									
Pull-off adhesion, ASTM D4541	All three tests gave pull-off adhesion values greater than 1000 psi.									
Resistance to impact, BS3900: Part E7	No defects evident in the coating system, including cracking, flaking or detachment from the substrate.									
Resistance to humidity, BS3900: Part F2: 1973	Panels inspected after 2000 hours exposure. No signs of softening, swelling, blistering or underfilm corrosion were evident.									
Resistance to Salt Spray, BS3900: Part F12: 1997	After 2000 hours exposure, rusting and rust staining was recorded at the parallel scratches, also undercutting was present due to failure of the original alkyd.									
Resistance to UV/Condensation, BS3900: Part F16: 1997	<p>No signs of cracking, flaking, blistering or loss of substrate adhesion were evident after 1000 or 2000 hours, however, significant chalking was evident after 1000 hours exposure. Changes in colour (CMC(2:1) colour difference equation) and gloss are detailed below.</p> <table border="1"> <thead> <tr> <th>Exposure Period</th> <th>Colour Change ΔE</th> <th>Change in gloss 60° Head</th> </tr> </thead> <tbody> <tr> <td>1000 hours</td> <td>9.36</td> <td>-63 G.U. (65 to 2)</td> </tr> <tr> <td>2000 hours</td> <td>7.42</td> <td>-64 G.U. (65 to 1)</td> </tr> </tbody> </table>	Exposure Period	Colour Change ΔE	Change in gloss 60° Head	1000 hours	9.36	-63 G.U. (65 to 2)	2000 hours	7.42	-64 G.U. (65 to 1)
Exposure Period	Colour Change ΔE	Change in gloss 60° Head								
1000 hours	9.36	-63 G.U. (65 to 2)								
2000 hours	7.42	-64 G.U. (65 to 1)								

3.2 JE Test Report

 <h2 style="margin: 0;">PAINTING REPORT</h2>			
JOB NO.:	Cmp/1547	REPORT NO.:	000
UNIT:	G3	INSPECTION DATE:	13/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		
<p>DESCRIPTION OF ITEM (State Drawing Nos. where applicable):</p> <p>Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint.</p> <p>(1) RA 500 _____ EPOXY SOLVENT-FREE SYSTEM .</p> <p>(2) R I 500 _____ EPOXY SOLVENT-FREE SYSTEM .</p> <p>(3) RL 500 _____ EPOXY SYSTEM WITH ADDED SOLVENT.</p> <p>(4) RS 500 _____ EPOXY SOLVENT-FREE SYSTEM .</p>			
<p>SUMMARY</p> <p>RA-500 _____ RI _____ RS _____ . Are all 100% volume solids.</p> <p>RL-500 _____ . 90% volume solids.</p> <p>RA 500 looks to be the better coat when applying, and can be seen to be flashing off within 30 min. (very good).</p> <p>RI 500 A Bit Harder to apply but as seen good overall coat. (good).</p> <p>RL 500 This application found to sag during application using brush,(more care when applying). (good).</p> <p>RS 500 This coat same as RI 500 When applying found to be a bit hard to apply. (good).</p>			
<p>OBSERVATIONS</p> <p>Four parts off an 8" lead coated pipe were prepared for coating, this pipe was also seen to be wet Prior To paint application.</p> <p>Remove all loose material .</p> <p>To final wire brush.</p> <p>To clean down.</p> <p>To apply to all four areas coating with different material (all areas coated on 13-09-02).</p> <p>Today 16-09-02 dollys were attach to these areas for adhesion testing which will Be carried out on 20-09-02.</p>			
<p>REPORT DATE: <u>13-09-02</u></p> <p>INSPECTOR: <u>A COOK</u></p>		<p>DISTRIBUTION:</p> <div style="border: 1px solid black; height: 60px; width: 100%;"></div>	

3.2 JE Test Report (cont.)

JE		PAINTING REPORT	
JOB NO.:	Cmp/1547	REPORT NO.:	001
UNIT:	G3	INSPECTION DATE:	18/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		
DESCRIPTION OF ITEM (State Drawing Nos. where applicable): Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint. (1) RA 500 _____ EPOXY SOLVENT-FREE SYSTEM . (2) R I 500 _____ EPOXY SOLVENT-FREE SYSTEM . (3) RL 500 _____ EPOXY SYSTEM WITH ADDED SOLVENT. (4) RS 500 _____ EPOXY SOLVENT-FREE SYSTEM .			
SUMMARY			
ADHESION PULL OFF RESULT			
Adhesion test carried out by A cook J E Coating Inspector.			
Item Tested ; 8" Pipe 4 off 12" areas marked up for testing with above materials			
Test instrument ; elcometer adhesion tester.			
Results ;			
RI 500	RA 500		
Dolly 1. (1150 psi) 100 %Cohesion	Dolly 3 1 (1150 psi) 100 % Cohesion		
RS 500	RL 500		
Dolly 2. (1250 psi) 100 % Cohesion	Dolly 4. (1350 psi) 100% Cohesion		
Test pipe wire brushed and cleaned, accepted, and painted with 4 different materials Over a wet surface (4 off) 12" areas dollys pulled on 18-09-02 at 9Am. Leaving a Further 4 off pull off tests to do on 20-09-02.			
OBSERVATIONS			
Note : A total off 8 dollys fitted at different angels .Date fitted 16-09-02. 4 Off In number pulled on 18-09-02. See above for test results.			
REPORT DATE:	18-09-02	DISTRIBUTION: 	
INSPECTOR:	A COOK		

3.2 JE Test Report (cont.)



PAINTING REPORT

JOB NO.:	Cmp/1547	REPORT NO.:	002
UNIT:	G3	INSPECTION DATE:	20/09/02
JOB TITLE:	PAINT TESTING ON LEAD COATED AND WET PIPE.		

DESCRIPTION OF ITEM (State Drawing Nos. where applicable):
 Test Carried Out On 8" Pipe with 4off different paints Supplied by chemco international paint.
 (1) RA 500 _____ EPOXY SOLVENT-FREE SYSTEM .
 (2) RI 500 _____ EPOXY SOLVENT-FREE SYSTEM .
 (3) RL 500 _____ EPOXY SYSTEM WITH ADDED SOLVENT.
 (4) RS 500 _____ EPOXY SOLVENT-FREE SYSTEM .

SUMMARY

ADHESION PULL OFF RESULT

Adhesion test carried out by A cook J E Coating Inspector.

Item Tested ; 8" Pipe 4 off 12" areas marked up for testing with above materials

Test instrument ; elcometer adhesion tester.

Results ;

RI 500	RA 500
Dolly 1. (1150 psi) 100 %Cohesion	Dolly 3 (1150 psi) 100 % Cohesion
RS 500	RL 500
Dolly 2. (1300 psi) 100 % Cohesion	Dolly 4. (1450 psi) 100% Cohesion

Further test carried out to same painted areas (different locations) .
 Test carried out to 09.00 hrs on 20-09-02

OBSERVATIONS

Note : After 7 Days Further 4 Dollys Pulled , see results above.

REPORT DATE: 23-09-02

INSPECTOR: A COOK

DISTRIBUTION:



3.3 Talisman Malaysia – Test Report

**PULL-OFF ADHESION
TEST REPORT**

AQUA PRIMER RS 500P



Sea Horse Services Sdn.Bhd. (258211-A)
(Data prepared: 23rd December, 2006)

REPORT PREPARED BY:	TESTS CONDUCTED BY:	TESTS WITNESSED AND VERIFIED BY:
 SEA HORSE SERVICES SDN. BHD.	 SIRIM QAS INTERNATIONAL SDN. BHD. <small>ABRIL AJTE HASEEN Senior Technical Executive Chemical Testing Section SIRIM QAS International Sdn. Bhd.</small>	 TALISMAN MALAYSIA LIMITED 

3.3 Talisman Malaysia – Test Report (cont.)



PULL-OFF ADHESION TESTS FOR AQUA PRIMER RS 500P

1.0 INTRODUCTION

1.1 Sea Horse Services Sdn. Bhd. has requested SIRIM QAS International Sdn. Bhd. to conduct the Pull-Off Adhesion Test to verify and confirm the manufacturer's claims as well as to prove to any prospective clients that the coating system will perform to ASTM D4541-02. The minimum strength that has been periodically requested by the clients is 450 p.s.i. The tests on the plates are to confirm that the coating system can withstand a pressure of at least 450 p.s.i.

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1.2 The tests were conducted by SIRIM QAS International Sdn. Bhd. in Chemical Testing Laboratory, which is accredited by SAMM under ISO 17025-2000 to perform these tests. The tests were conducted by SIRIM QAS International Sdn. Bhd. personnel and witnessed by Sea Horse Services Sdn. Bhd. and Talisman Malaysia Ltd. personnel. The results are attached to this document report.

1.3 The coating system tested is the AQUA PRIMER RS 500P

2.0 TEST PLATES

2.1 Three (3) nos. plates labelled Plate No. 1, Plate No. 2 and Plate No. 3 are tested and the surfaces were prepared as follows:

2.1.1 Plate No. 1: Rusted surface with mill scale and prepared to ST 2 standards.

2.1.2 Plate No.2 : Grinded wet surface.

2.1.3 Plate No. 3: Power-tooled.

3.0 TEST STANDARDS & PROCEDURES

3.1 For each of the plates, 3 dillies were attached as the glue left to dry for at least 24 hours. Please refer to **Attachment 1** for the positions of the dillies. The thickness of each of the location was recorded.

3.2 The tests were carried out after the glue has cured and the tests were carried out by SIRIM QAS International Sdn. Bhd.'s personnel in the presence of Sea Horse Services Sdn. Bhd. 's and Talisman Malaysia Limited's personnel. Please refer to **Attachment 2** on the tests.

3.3 The tests were carried out using a manual pull-off equipment and the data recorded.

3.3 Talisman Malaysia – Test Report (cont.)

SEA HORSE SERVICES SDN. BHD. (20211-A)

3.4 The thickness of each location of the dolies were checked. Please refer to Attachment 3 on this test.

3.5 The tests were carried out by SIRIM QAS International Sdn. Bhd. following and complying with the international standards of tests namely ASTM D4541-02.

4.0 TEST RESULTS

4.1 The test results are shown in the following pages.

5.0 CONCLUSION

5.1 The tests were carried out and it can be concluded that the coating system AQUIA PRIMER RS S20P has complied with the minimum adhesion strength of 450 p.s.i.

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REPORT PREPARED BY: TESTS CONDUCTED BY: TESTS WITNESSED AND VERIFIED BY:

 SEA HORSE SERVICES SDN. BHD.


AMIRUL AZIZ HASSAN
Bendahara Teknikal / Executive
Technical Testing Section
SIRIM QAS International Sdn. Bhd.


MATHEW
TALISMAN MALAYSIA LIMITED



NO 47-C, JALAN SDC2, GREEN TECHNOLOGY PARK, SEREMBAN 2, 7000 SEREMBAN, NEGERI SEMBILAN D.K.
TEL: +606-6012572, +606-6014503; FAX: +606-6013575; E-MAIL: kytan@stmms.com
Engineering Solutions/Repair/Restoration – Diving-Coatings-Painting-Chemicals-Ultra High Water Pressure Jet

3.3 Talisman Malaysia – Test Report (cont.)



PULL-OFF ADHESION TESTS
JOINT-WITNESS TESTS

TESTS DETAILS:

PLATE NOS.	1 (Bolted surface with mill scales; prepared to ST 2)
REPORT NO.	SHS-SRIM/REP/001/2007
METHOD	ASTM D4541-02 STANDARD TEST METHOD FOR PULL-OFF STRENGTH OF COATINGS USING PORTABLE ADHESION TESTERS
PAINTING SYSTEM	AQUA PRIMER RS 500P
SUBSTRATE	CARBON STEEL
CLIENT	TALISMAN MALAYSIA LTD.
PAINTING/COATING SYSTEM OWNER	SEA HORSE SERVICES SDN. BHD.
LOCATION/AREA OF TESTS	SIRIM QAS INTERNATIONAL SDN. BHD., SHAH ALAM, SELANGOR D.E.
DATE OF DOLLY ATTACHMENT	11/12/2006
DATE OF DOLLY PULL-OFF	18/12/2006
TYPE OF ADHESIVE USED	EPOXY GLUE
TYPE OF INSTRUMENT USED	MANUAL PULL-OFF
MINIMUM ADHESION REQUIRED	450 p.s.i.

RESULTS

DOLLY POSITION	DFT-BEFORE (MICRONS)	DFT-AFTER (MICRONS)	PULLED-OFF RESULTS IN N/mm ² (psi)	REMARKS
A	59.3	59.3	>7 (>1,015)	50% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
B	59.1	59.1	>7 (>1,015)	50% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
C	71.5	71.5	>7 (>1,015)	30% adhesion failure. Adhesion minimum strength more than 450 p.s.i.

*">" denotes "more than"

CONDUCTED BY:  SIRIM QAS INTERNATIONAL SDN. BHD.

WITNESSED BY:  SEA HORSE SERVICES SDN. BHD.

WITNESSED BY:  TALISMAN MALAYSIA LTD.

NO. 47-C, JALAN 52/2, GREEN TECHNOLOGY PARK, SEREMBAN 2, 70300 SEREMBAN, NEGERI SEMBILAN D.K.TEL: +606-8121822, +606-8134900; FAX: +606-8131575; E-MAIL: info@talisman.com
Engineering Solutions/Repair/Restoration – Dying-Coating-Painting-Chemicals-Ultra High Water Pressure Jet

3.3 Talisman Malaysia – Test Report (cont.)

SEA HORSE SERVICES SDN. BHD. (39011-A)

PULL-OFF ADHESION TESTS
JOINT-WITNESS TESTS

TESTS DETAILS:

PLATE NOS.	2 (Grinded wet surface)
REPORT NO.	SHS-SRIM/REP/002/2007
METHOD	ASTM D4541-02 STANDARD TEST METHOD FOR PULL-OFF STRENGTH OF COATINGS USING PORTABLE ADHESION TESTERS
PAINTING SYSTEM	AQUA PRIMER RS 500P
SUBSTRATE	CARBON STEEL
CLIENT	TALISMAN MALAYSIA LTD.
PAINTING/COATING SYSTEM OWNER	SEA HORSE SERVICES SDN. BHD.
LOCATION/AREA OF TESTS	SIRIM QAS SDN. BHD., SHAH ALAM, SELANGOR D.E.
DATE OF DOLLY ATTACHMENT	15/12/2006
DATE OF DOLLY PULL-OFF	18/12/2006
TYPE OF ADHESIVE USED	EPOXY GLUE
TYPE OF INSTRUMENT USED	MANUAL PULL-OFF
MINIMUM ADHESION REQUIRED	450 p.s.i.

RESULTS

DOLLY POSITION	DFT-BEFORE (MICRONS)	DFT-AFTER (MICRONS)	PULLED-OFF RESULTS IN N/mm ² (psi)	REMARKS
A	64.9	64.9	>7 (>1,015.0)	30% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
B	64.4	64.4	4.3 (632.5)	90% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
C	60.4	60.4	6.8 (986.0)	85% adhesion failure. Adhesion minimum strength more than 450 p.s.i.

*" >" denotes "more than"

CONDUCTED BY:  **SIRIM QAS INTERNATIONAL SDN. BHD.**

WITNESSED BY:  **SEA HORSE SERVICES SDN. BHD.**

WITNESSED BY:  **TALISMAN MALAYSIA LTD.**

NO.47-C, JALAN 53/2, GREEN TECHNOLOGY PARK, SEREMBAN 2, 7000 SEREMBAN, NEGERI SEMBILAN D.K.TEL: +603-8113571, +606-6014503, FAX: +606-6013577, E-MAIL: info@shservices.com
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3.3 Talisman Malaysia – Test Report (cont.)


SEA HORSE SERVICES SDN. BHD. (298211-A)

ADHESION PULL-OFF TESTS
JOINT-WITNESS TESTS

TESTS DETAILS:

PLATE NOS.	3 (Power-tooled)
REPORT NO.	SHS-SIRIM/REP/003/2007
METHOD	ASTM D4541-02 STANDARD TEST METHOD FOR PULL-OFF STRENGTH OF COATINGS USING PORTABLE ADHESION TESTERS
PAINTING SYSTEM	AQUA PRIMER RS 500P
SUBSTRATE	CARBON STEEL
CLIENT	TALISMAN MALAYSIA LTD.
PAINTING/COATING SYSTEM OWNER	SEA HORSE SERVICES SDN. BHD.
LOCATION/AREA OF TESTS	SIRIM QAS INT. SDN. BHD., SHAH ALAM, SELANGOR D.E.
DATE OF DOLLY ATTACHMENT	15/12/2006
DATE OF DOLLY PULL-OFF	18/12/2006
TYPE OF ADHESIVE USED	EPOXY GLUE
TYPE OF INSTRUMENT USED	MANUAL PULL-OFF
MINIMUM ADHESION REQUIRED	450 p.s.i.

RESULTS

DOLLY POSITION	DFT-BEFORE (MICRONS)	DFT-AFTER (MICRONS)	PULLED-OFF RESULTS IN N/mm ² (psi)	REMARKS
A	94.9	94.9	>7 (>1,015.0)	40% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
B	118	118	>7 (>1,015.0)	30% adhesion failure. Adhesion minimum strength more than 450 p.s.i.
C	123	123	>7 (>1,015.0)	40% adhesion failure. Adhesion minimum strength more than 450 p.s.i.

*">" denotes "more than"

<p>CONDUCTED BY:</p>  <p>SIRIM QAS INTERNATIONAL SDN. BHD.</p>	<p>WITNESSED BY:</p>  <p>SEA HORSE SERVICES SDN. BHD.</p>	<p>WITNESSED BY:</p>  <p>TALISMAN MALAYSIA LTD.</p>
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NO.47-C, JALAN 5/2C, GREEN TECHNOLOGY PARK, SEREMBAN 2, 70000 SEREMBAN, NEGERI SEMBILAN D.K.TEL: +606-8013572, +1 26-8014523; FAX: +606-8013573; E-MAIL: info@shservices.com
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APPENDIX 4

REFERENCE LETTERS

4.1 Reference Letter: V. Ships



*V. Ships UK Limited
Skypark
8 Elliot Place
GLASGOW G3 8EP
Ph: + 44 141 243 2435
Fax: +44 141 243 2436
www.vships.com*

4th December 2007

Dear Manni,

We have used Chemco moisture tolerant RS 500P epoxy for the repair and maintenance works in several of our managed vessels.

We have monitored these areas on routine inspections and are satisfied by the performance and intend using this coating for future works as a flexible coating for applications at sea and in dock.

Prior to application the steel substrates were prepared by mechanical cleaning and HP washing. The coating was then applied, in one coat, at a thickness of between 150 - 200 microns.

It is our view that solvent free epoxy coatings with moisture tolerant properties will become the norm for projects where time is the major constraint.

Yours sincerely,

Corinne Burley

*Fleet Manager
V. Ships UK Ltd.*

4.2 Reference Letter: Yeoman

M.V. Yeoman Bridge.

22nd April 2010

Re :- Chemco coatings

To whom it may concern

For the past five years we have been using Chemco as a protective coating after carrying out ballast tank repairs on both our two sister vessels – Yeoman Bridge and Yeoman Bontrup. The repairs consisting mainly of longitudinal fractures being gouged / welded and new soft nose brackets fitted. Shellplate renewals in drydock due to fractures. Shellplate / internal renewals due to tug / fender damage.

Preparation of the steel is by power tooling / wire brushing to remove any scale/gingering, and feathering of the original coal tar epoxy coating, which Chemco is compatible with. Although Chemco is moisture tolerant we always try to have the steel as dry as possible. Prior to application tins containing the primer and top coats are brought into a warm environment the day before to bring them up at least 10 degs C, as recommended by the manufacturer.

Application is by brush or roller, allowing 16 hours between primer and top coat.

Typical thickness when applied : –

Primer - 200 ~ 250 microns.

Top Coat – 200 ~ 250 microns.

We have been using Chemco now for five years and during that time we have nothing but praise for this product. Years after it has been applied, you can go to an old repair, and the chemco coating is as good as the day it was applied, with no signs of breakdown whatsoever. It is a first class product hence the reason we use it, and will continue to use it, and only it, in our ballast tanks.

Geoff McRorie



Yeoman Glensanda Marine Superintendent

4.3 Reference Letter: AET Shipmanagement



**AET Shipmanagement
(USA) LLC**
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Houston TX 77027
USA
T +1 (832) 615 2000
F +1 (713) 622 2256
www.aet-tankers.com

We hereby confirm the use of CHEMCO **RS 500P** anticorrosive coating system for the refurbishment of the Sea Water Ballast Tanks of the "MT EAGLE ANAHEIM". This project took place in Huangpu - P. R. of China, in September/October 2014.

The goal was to carry out the refurbishment in the shortest possible duration cost effectively whilst achieving long term corrosion protection. Consequently Chemco specialist system was chosen due to the moisture (wet) and surface (rust) tolerance capabilities, both for "less demanding" surface preparation standards and for wet surfaces. Utilising this product enabled the use of Hydro-blasting for surface preparation without delays or downtimes.

The Technical support provided by CHEMCO International was vital to ensure the satisfactory completion of the project on time.

CHEMCO INTERNATIONAL LTD (GB556463226), supplied the below mentioned product from UK and also from stocks available in Singapore.

Supply Date	Designation (products)	Technical Characteristics
August and October 2014	RS 500P	Wet and rust tolerant, solvent-free epoxy

Houston Tx, USA, November 2014

Superintendent Mr. Abdul Majeed
AET Ship Management (USA) LLC.

1/1

Company registration no 4886504