



REPORT

CHEMICAL TANK LINING SYSTEMS

Marine Industry

August 2018

Contents

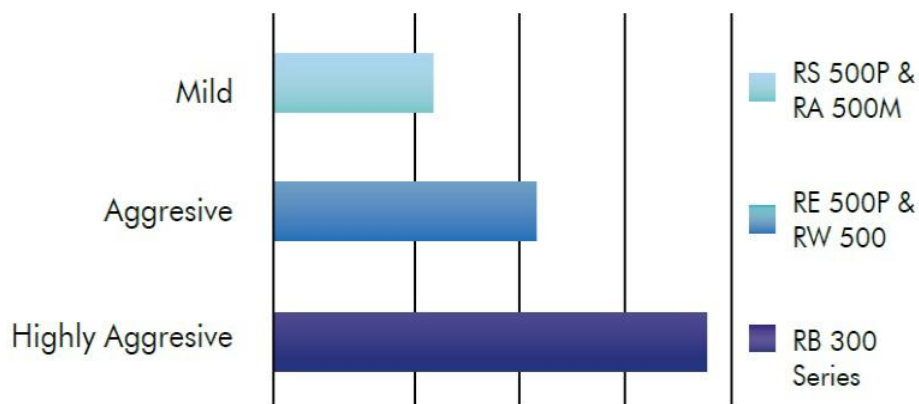
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Introduction

Chemco offer three cargo tank lining systems specifically designed for application within chemical tankers, covering the full pH range 1 to 14:

- Type 3: Epo-chem™ RS 500P & RA 500M
- Type 2: Epo-chem™ RE 500P & RW 500
- Type 1: Epo-chem™ RB 300 Series

Chemical Environment Chart



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 – **RS 500P & RA 500M**
- Lloyds Approval:
 - Lloyds Approval – Ballast Tank Maintenance Coating – **RS 500P**
 - Lloyds Approval – Ballast Tank Maintenance Coating – **RA 500M**
 - Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Bare Steel
 - Lloyds Type Approval – IMO Resolution MSC.215 (82) PSPC for New Build – Shop Primer
- NSF Certificate – Fresh Drinking Water System – **RS 500P & RA 500M**
- FDA Approval:
 - FDA Approval – Food Contact – **RA 500M**
 - FDA Approval – Potable Water – **RA 500M**

Our Systems



Type 3: Epo-chem™ RS 500P and RA 500M

Solvent-free, high performance, **wet & rust tolerant**, glassflake epoxy coating system providing good resistance to general chemicals: crude oil, refined oil, saltwater and greywater.

This system has been IMO approved for application in sea water ballast tanks and crude oil cargo tanks. It has also been certified by NSF for potable water applications and is FDA compliant for carrying food and potable water.

Type 2: Epo-chem™ RE 500P and RW 500

Solvent-free, **rust tolerant**, high temperature, glassflake epoxy Novolac system offering excellent resistance to highly aggressive chemicals: ethanol, methanol and caustic soda.

Type 1: Chem-tect™ RB 300

100% solid, high quality, glassflake vinylester system offering exceptional resistance to aggressive chemicals at high temperatures: acids and solvents.

Type 3: Epo-chem™ RS 500P & RA 500M



System Benefits:

- Solvent-free
- Wet & rust tolerant
- Reduced Health & Safety and Fire Hazard
- Excellent resistance to general chemicals
- Major cost savings (reduced labour, surface preparation and equipment cost)
- No humidity or dew point restrictions
- Compatible with all epoxy shop primers and existing tank linings

Type 2: Epo-chem™ RE 500P & RW 500



System Benefits:

- Solvent-free
- Any surface preparation method can be utilised (abrasive blasting, water jetting or mechanical preparation)
- Excellent chemical and high temperature resistance
- Reduced Health & Safety and Fire Hazard
- Reduced overall project cost and downtime
- Environmentally Friendly System

Type 1: Chem-tect™ RB 300 Series



System Benefits:

- Excellent resistance to the most aggressive chemicals at high temperatures
- Ideal tank lining system for multi-purpose chemical storage vessels
- Excellent resistance to thermal ageing, severe corrosive and abrasive environments
- Full pH protection (1 - 14)
- **Maintenance-free** and easy to repair
- Fast curing allows quick over-coating, fast application and quick back-in-service times

CASE STUDIES

CASE STUDY 1: Ballast Tank Refurbishment – 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)

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1



2



Photographs

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

CASE STUDY 1: Ballast Tank Refurbishment – MV Auxis (cont.)

<p>3</p> 	<p>4</p> 
<p>5</p> 	<p>6</p> 
<p>7</p> 	<p><u>Photographs</u></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

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CASE STUDY 2: Cargo Tank Refurbishment – Oil Products Tanker

Case Study



Client: <i>James Fisher Everard Ltd</i>	Industry: <i>Marine</i>
Vessel: <i>Oil Products Tanker</i>	Date: <i>June 2014</i>
Location: <i>Cork, Ireland</i>	Products: <i>Epo-chem™ RS 500P & RA 500M</i>

Overview

The cargo tanks onboard the Oil Products Tanker required a full refurbishment after the existing coating system had failed and the tanks were showing signs of severe corrosion damage.

Challenge

Removing the existing failed coating system on all areas to be coated with Chemco products. Finding a coating system which could be applied on surfaces prepared to WJ4 standards. Working within a tight timescale also added to the difficulty of this project.

Solution

The surfaces in all cargo tanks were prepared by water jetting to WJ-4 standards and grinding. One stripe coat of solvent-free, wet & rust tolerant Epo-chem™ RS 500P was applied followed by one full coat of Epo-chem™ RS 500P. One topcoat of solvent-free, wet tolerant, glassflake reinforced Epo-chem™ RA 500M was then applied.

Outcome

The project was completed on time, with no major delays and to the satisfaction of the ship superintendent.

Benefits

- Solvent-free
- Wet & rust tolerant
- No grit blasting required
- Reduced H&S and Fire Precaution
- No delays
- System can be applied at sea

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1



2



Photographs

- No. 1 Before Application
- No. 2 Stripe Coat in Progress

CASE STUDY 2: Cargo Tank Refurbishment – Oil Products Tanker (cont.)

<p>3</p> 	<p>4</p> 
<p>5</p> 	<p>6</p> 
<p>7</p> 	<p><u>Photographs</u></p> <ul style="list-style-type: none">• Nos. 3-4 After Application of Primer• Nos. 5-7 Completed Application

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CASE STUDY 3: Chemical Tank Refurbishment – Chemical Carrier

Case Study



Client: Chemical Tanker Owner	Industry: Marine
Vessel: Chemical Carrier	Date: March 2014
Location: Singapore	Products: Epo-chem™ RE 500P & RW 500

Overview

A chemical carrier belonging to a major shipping company had one of their vessels inspected in Singapore and it was found that the tank top areas of their chemical tanks, which had previously been coated with a phenolic epoxy system, had severely de-tached.

Challenge

Grit blasting could not be used due to the location of the vessel at quayside. The project also had to be completed within one week to allow the vessel to pick up cargo within the chartering time.

Solution

Water-jetting (800-1000 bar) to WJ-2 standards was selected as the surface preparation method to be utilised. One stripe coat of solvent-free, rust tolerant Epo-chem™ RE 500P was then applied on a rusty surface, followed by one full coat of Epo-chem™ RE 500P. To complete the coating system, two full coats of solvent-free, glassflake epoxy topcoat Epo-chem™ RW 500 was applied.

Outcome

The work program was successfully completed in 5 days and was overseen by Chemco Singapore's technical department. Substantial time and cost savings were achieved to the satisfaction of the owners. The fast post curing was seen as a major advantage of this system. All cargo tanks were completed to class standard and certified accordingly.

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Photographs

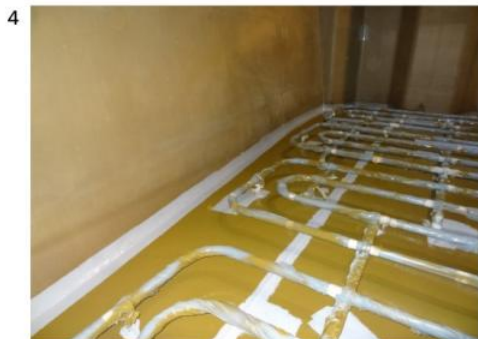
- Nos. 1-2 Before application

*This project was carried out by
Chemco Speciality Coatings Singapore

CASE STUDY 3: Chemical Tank Refurbishment – Chemical Carrier (cont.)

Benefits

- Solvent-free
- Excellent chemical and high temperature resistance
- No grit blasting
- Fast-curing and quick over-coating (faster application)
- Reduced contract duration and downtime
- Reduced H&S and Fire Precaution
- No major delays
- Ease of decontamination (no cargo contamination)
- High gloss finish



Photographs

- Nos. 3-4 Stripe coat on top of primer
- Nos. 5-6 Completed application

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CASE STUDY 4: Chemical Tank Refurbishment – Chemical/Oil Carrier

Case Study



Client: <i>Intrepid Chem 1021 Corporation</i>	Industry: <i>Marine</i>
Vessel: <i>Chemical/Oil Carrier</i>	Date: <i>September 2013</i>
Location: <i>Antwerp Ship Repair Yard</i>	Products: <i>Epo-chem™ RE 500P & RW 500</i>

Overview

The chemical/oil carrier, built in 2011 and operated by Bernard Schulte Cyprus, had a requirement for a cargo tank refurbishment of 1200m² after the original coating (from new) had suffered failure.

Challenge

To remove all the previous coating to a sound substrate and provide a protective lining that would withstand a wide range of aggressive chemicals at high temperatures. Due to the clients budget and time constraints, a cost-effective alternative surface preparation method to grit blasting had to be considered. Chemco offered to utilise a revolutionary method of water blasting and use of a solvent-free coating system for the first time in this industry. The refurbishment process had to be completed within 10 days.

Solution

To achieve this challenge, water blasting was chosen as the alternative surface preparation method. Chemco's unique Epo-chem™ RE 500P and RW 500 were specified as the preferred coating system. Epo-chem™ RE 500P is a solvent-free, surface (rust tolerant) epoxy Novolac primer and RW 500 is a solvent-free epoxy Novolac glassflake topcoat. The original coating was removed by high pressure water jetting to achieve a WJ-2 standard. The following specification was applied:

- One stripe coat: RE 500P @ 100µ DFT
- One full coat: RE 500P @ 100µ DFT.
- One stripe coat: RW 500 @ 250µ DFT.
- Two topcoats: RW 500 @ 250µ DFT each.

Total DFT = 600µ

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Photographs:

- Nos. 1-2 Original Failed Condition of Existing Lining
- No. 3 Stripe Coat of Epo-chem™ RE 500P on the Rusty Surface

CASE STUDY 4: Chemical Tank Refurbishment – Chemical/Oil Carrier (cont.)

Outcome

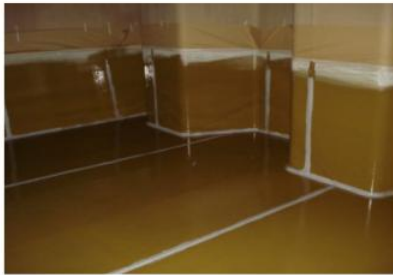
The work programme was successfully completed by Chemco's approved contractor, MSTC Global, in 10 days (including 3 days for post-curing). Substantial time and cost savings were achieved by post-curing to 35°C instead of the industrial procedure of 70°C. The system will increase the vessel cargo tank life-expectancy by another 5 - 10 years as requested by the owner. All the cargo tanks were completed to class standard and certified accordingly to the satisfaction of all concerned.

Benefits

With the Chemco system being applied to a water-jetted surface, it enabled the job to be completed ahead of schedule in 10 days, instead of 21 days as originally quoted by other contractors. Full refurbishment of cargo tanks utilising the procedure of water-jetting is a revolutionary breakthrough for the marine industry which has the following benefits:

- Solvent-free
- Excellent chemical and high temperature resistance
- No grit blasting
- Fast-curing and quick over-coating (faster application)
- Reduced contract duration and downtime
- No major delays
- Ease of decontamination (no cargo contamination).
- High gloss finish
- Chemco systems will protect the substrate for a minimum of 5 years

4



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7



Photographs:

- No. 4 Stripe Coat of Epo-chem™ RW 500 on Primed Surface of Epo-chem™ RE 500P
- No. 5 Contrast Between Finished Application of Epo-chem™ RW 500 and Original Surface
- No. 6 COT 2 Starboard After Carrying Ethanol for 14 days
- No. 7 COT 5 Port After Carrying Ethanol for 14 days

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CASE STUDY 5: Chemical Tank Refurbishment – Chemical Tanker

Case Study



Client: Brøvigtank AS	Industry: Marine
Vessel: Chemical Tanker	Date: April 2014
Location: Gdynia, Poland	Products: Chem-tect™ RB 364 & RB 300TC

Overview

The tank tops found inside four cargo tanks (3 Port, 4 Port, 4 Starboard & 6 Port), onboard the Chemical Tanker, required a full refurbishment as they were showing signs of severe corrosion damage.

Challenge

Replacing the original failed coating with a new protective coating system capable of handling highly aggressive chemicals at high temperatures. Working within a strict time frame also added to the difficulty of this project.

Solution

The tank tops and the bulkheads (up to 0.5m high) were grit blasted to Sa 2.5 standards. Prior to the coating application, the surfaces were swept and vacuumed to remove any dust and other contamination.

The coating specification was as follows:

- Two coats of Chem-tect™ RB 364 @ 500µ DFT per coat by airless spray.
- One stripe coat of Chem-tect™ RB 364 by brush.
- One topcoat of Chem-tect™ RB 300TC @ 100µ DFT by airless spray.

Outcome

The work was carried out within the given time frame, with no delays and was supervised by Chemco's technical staff. All cargo tanks were completed to class standard and certified accordingly to the satisfaction of all concerned.

Benefits

- Excellent resistance to highly aggressive chemicals at high temperatures
- Fast curing allows quicker over-coating and quicker back-in-service times
- Reduced downtime
- Reduced H&S and Fire Precaution







Continued overleaf



Photographs:

- Nos. 1-2 Original Condition
- No. 3 After First Coat of Chem-tect™ RB 364

CASE STUDY 5: Chemical Tank Refurbishment – Chemical Tanker (cont.)

<p>4</p> 	<p>5</p> 
<p>6</p> 	<p>7</p> 
<p>8</p> 	<p>9</p> 
<p>Photographs:</p> <ul style="list-style-type: none">• No. 4 After First Coat of Chem-tect™ RB 364• No. 5 After Second Coat of Chem-tect™ RB 364• Nos. 6-9 Completed Application	

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CASE STUDY 6: Chemical Tank Refurbishment – Chemical Tanker (Vadero)

Case Study



Client: <i>Vadero Shipping</i>	Industry: <i>Marine</i>
Vessel: <i>Chemical Tanker</i>	Date: <i>May - June 2013</i>
Location: <i>Gryfia Shipyard, Szczecin, Poland</i>	Product: <i>Chem-tect™ RB 364</i>

Overview

A Chemical Tanker had a requirement for cargo tank refurbishment for over 3,500m². The vessel would carry a selection of a very aggressive range of chemicals at high temperature.

Challenge

Complete failure of the previous lining as supplied by a major paint company had occurred; the usual phenolic epoxy specified and used would not have the resistance and had to be completely removed and a suitable coating applied; the new lining had to be resistant to most acids and alkaline chemicals at high temperature.

Solution

Chemco's new specification was based on a unique chemical resistant coating suitable for full pH range at high temperature as follows:

Surface preparation standard: Grit blast to Sa 2½

Coating: Two coats of Chem-tect™ RB 364 @ 500µ DFT per coat plus one stripe coat of Chem-tect™ RB 364.

Total DFT: Minimum 1,000µ

Outcome

The work programme was successfully completed within the requested time-scale and supervised by Chemco technical staff. All the cargo tanks were completed to class standard and certified accordingly to the satisfaction of all concerned.

Benefits

The advantages of this coating for these cargo tanks was to provide excellent resistant to high temperatures and to a wide range of corrosive chemicals. Fast-curing allowed quicker over-coating, fast application and quick return to service. The main advantage of the system is that it can be patch repaired and the repairs are 100% successful.

Continued overleaf



Photographs:

- Nos. 1-2 Original Condition of Cargo Tanks Before Preparation
- No. 3 Tank After First Coat of RB 364

CASE STUDY 6: Chemical Tank Refurbishment – Chemical Tanker (Vadero) (cont.)

4



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Photographs:

- No. 4 Tank (port) After Stripe Coating
- No. 5 Tank (port) After Second Coat of RB 364
- No. 6 Tank (starboard) After Stripe Coating
- No. 7 Tank (starboard) After Second Coat of RB 364
- Nos. 8-9 Tank (starboard) After Second Coat of RB 364

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