

*Marine***LINE**[®]

Protective Tank Coatings in the Modern Era
Presenting MarineLine[®] Tank Coating Systems



 **ADVANCED**
POLYMER COATINGS

What Do Shipowners Want from their Chemical Tankers?

- **Generate a strong return on Investment (ROI) over the life of the tank coating.**
- **Easy tank cleaning and drying for fast turnaround with minimal downtime.**
- **Versatility with the ability to carry a wide range of chemical, CPP and Veg Oil cargoes.**



What Do Shipowners Want from their Chemical Tankers?

- Assurance of product purity from port to port.
- Tank coating application and curing are done correctly and certified.
- Ongoing tank coating inspection/management for worry-free performance.



This presentation will show how the MarineLine[®] 784 coating meets these needs.

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The Technology Behind MarineLine Coatings

- The coatings are formulated with a cross-linked organic-inorganic polymer that offers high heat resistance and excellent corrosion resistance properties, far superior to other materials on the market without compromising material flexibility (non-brittle) or toughness.



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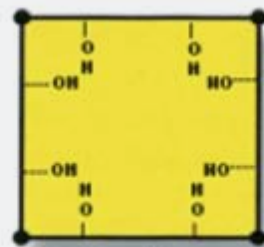
APC Develops New Markets for Coatings

- This polymer technology was used to attack the corrosive deficiencies typically found in conventional epoxy and zinc silicate coatings and linings.
- The company marketed specialty protective coatings to serve different industries including:
 - chemical
 - storage tanks and terminals
 - petro-chemical manufacturing
 - flooring
 - storage/ secondary containment
 - power generation
 - rail and over-the-road transportation



The Chemistry Behind MarineLine - Problems with Epoxies

Phenolic Epoxies form 3 dimensional screen-like structures with hydroxyl formation inside the crosslink structure when cured.



Phenol Epoxy
2 Functionality
Form 4 Crosslinks
with Hydroxyl Formation

- Absorbs cargo to high levels (depending on cargo)
- Releases absorbed cargo very slowly
- Small traces may be retained
- Subsequent cargo contamination

CLEAN EPOXY



New Phenol Epoxy Coating

CARGO VOYAGE



Swelling due to absorption (1)

AFTER DISCHARGE

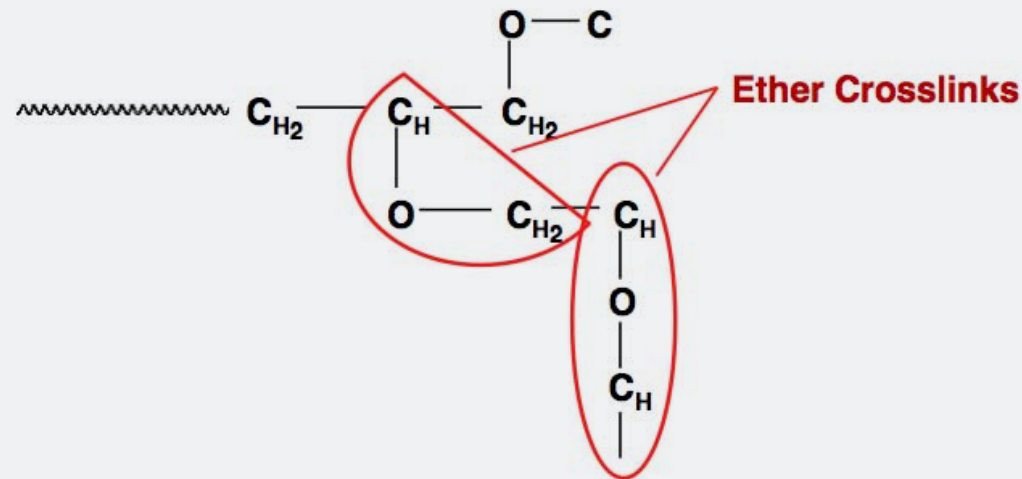


Epoxy with absorbed cargo (2)

- (1) Reason for swelling: Hydroxyl groups are hydrolizable (Hydrolysis – chemical decomposition in which a compound is broken down and changed into other compounds by hydrogen and/or oxygen) (the elements of water)
- (2) Absorbed cargo plus other compounds

The Chemistry Behind MarineLine - A Solution Emerges

Homopolymerization of MarineLine®



MarineLine® is cross linked by an ether (c-o-c) structure, one of the strongest bonds in chemistry, meaning there are no hydroxyl groups available for hydrolysis in MarineLine®.

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The Chemistry Behind MarineLine - A Solution Emerges

- **MarineLine[®] has been tested and proven superior vs. conventional coatings such as inorganic zincs, phenolic epoxies, and stainless steel.**
- **MarineLine[®] resists 98% of corrosive acids, alkalis, solvents, gasses and materials at various temperatures.**
- **Outside, independent testing has also verified this performance and strengthens the case against competitive coatings and stainless steel.**

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MarineLine 6 Steps for Application, Curing and Inspection

- To ensure the performance of MarineLine® it is imperative that APC provide inspection services.
- APC focuses on the importance of good surface preparation, correct application and proper heat cure, in a 6-Step approach.
- MarineLine® has set the benchmark regarding heat curing, and then spark testing the entire tank surface.
- The APC approach has proven very successful for tankers up to 38,000 DWT.



MarineLine Success - Step 1- Pre-Blast

- Weld & Grind Inspection
- Staging
- Dehumidification
- Ventilation
- Rain Protection
- Surface Contamination Testing
- Surface Protection



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MarineLine Success - Step 2 - Blasting

- Surface Profile
- Surface Cleanliness
- Environmental Conditions
- Cleaning
- Blasting
- Visual Blast Inspection
- Rejection of Blast Quality



MarineLine Success - Step 3 - Spray Application

- Environmental Conditions
- Mixing Thinners
- Base Coat (shown here)
- Stripe Coat
- Top Coat



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MarineLine Success - Step 4 - Inspection

- Dry Film Thickness Test
- Spark Test

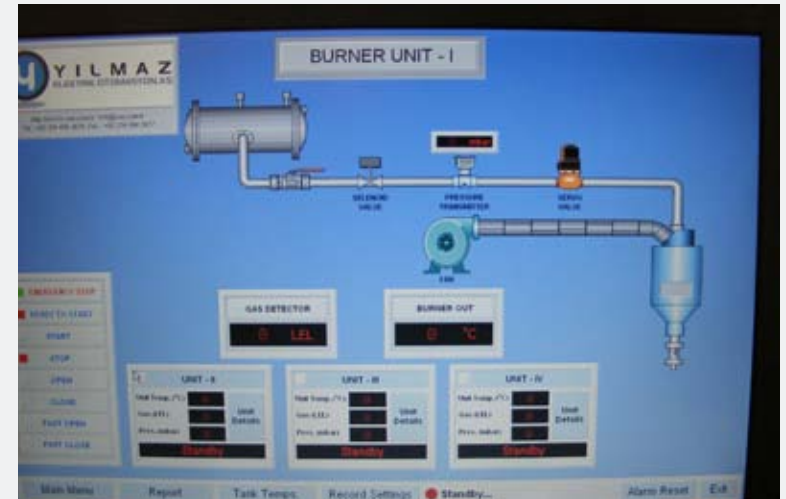


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MarineLine Success - Step 5 - Heat Cure

- Equipment
- Charting
- Set-up
- Curing



MarineLine Success - Step 6 - Final Inspection & Sign-Off

- Hardness Test
- Solvent Wipe Test
- Inspection Report Prepared



MarineLine Provides Profitable Benefits - ROI

- MarineLine® is becoming the preferred coating for marine cargo tanks due to fast return on investment.
- MarineLine® cost more in material/curing, but the higher performance of the coating means the investment is recouped faster - in 12-24 months.
- Opportunity to charge higher chartering rates for more aggressive cargoes.



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MarineLine Provides Profitable Benefits - Easy Cleaning

- **Extremely smooth surface makes cleaning fast**
- **Less slops**
- **Less cleaning chemicals needed**
- **Cleaning benefits are achieved through non-absorption, low surface energy and smooth surface**



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MarineLine Provides - Profitable Benefits - Versatility

- MarineLine® offers the owner the ability to carry all cargoes on the IMO list, including:
- Acrylonitrile, VAM, Methanol, Palm Acid, Acetic Acid
- Ships can leave the yard after certification and load aggressive cargoes immediately.
- Owners can carry cargoes that were previously allotted for stainless steel tanks only.

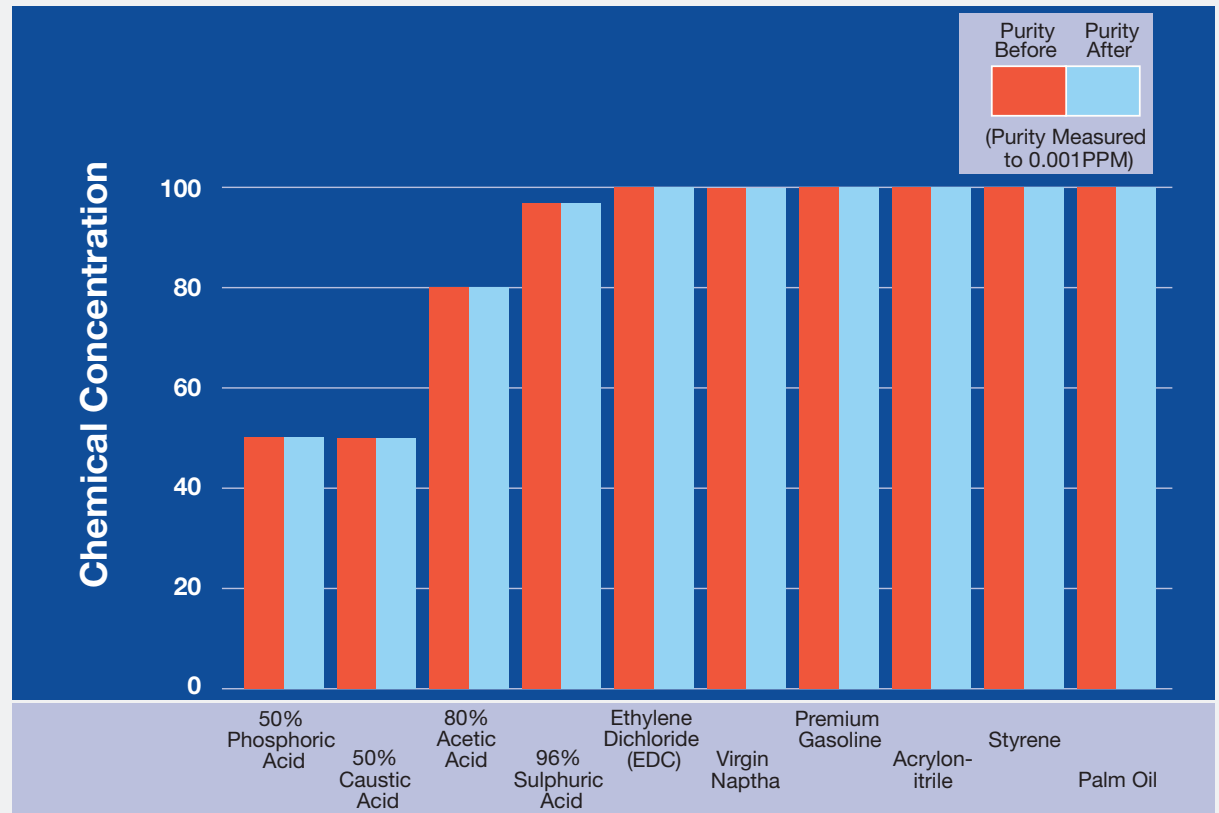


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MarineLine Provides Profitable Benefits - Product Purity

MarineLine[®] cross-linked structure means the coating will not absorb the cargo, thus ensuring product purity, from port to port.



Products Tested: tests certified or performed by DNV, Verwey Labs and other independent labs.

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MarineLine Provides Profitable Benefits - Application Assurance

APC's six-step approach provides assurance that tank coating application and curing are done correctly and certified.

1. Pre-Blast

2. Blasting

3. Spray Application

4. Inspection

5. Heat Cure

6. Final Inspection

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Thank You!

Thank you for your interest in MarineLine®.

We are pleased to answer your questions.

***Marine*LINE® 784**

www.adv-polymer.com

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