Coatings in the Modern Era for Small Carriers

Innovative Tank Coatings Enhance Cleaning Efficiencies for Higher ROI

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Chemical and product tanker owners are faced with the daily challenge of maximizing their profitability while being able to carrying high end cargoes.

In order to do this they must be able to provide their customers the ability to carry high end cargoes without the risk of cross product contamination. In the past, in order to achieve this need, they would utilize stainless steel tanks to provide high product purity. Today however, through the next generation of cargo tank coatings, MarineLine® is able to deliver this same product purity at one third the cost.

Cargo tanks are the revenue generator for chemical and product tank owners. In order to maximize revenue they have to be capable of loading the most aggressive chemicals. MarineLine® provides owners this opportunity by using polymer technology to provide a nearly impermeable barrier to protect the cargo tank from chemical attack and keep the steel intact. However, the key benefit of this high technology coating is its ability to resist cargo absorption. This characteristic alone provides the owner the benefits of easy cleaning and greatly reduces the risk of cargo contamination.

BACKGROUND

Today, MarineLine® is used on hundreds of chemical and product tankers worldwide, providing owners these unique benefits. When properly applied and cured, MarineLine® creates an extremely smooth, hard, slick surface that provides owners with a solution to their most pressing need, cargo resistance. This cargo resistance is created by the highly cross-linked polymer structure of the MarineLine® coating. There is no other tank coating on the market like MarineLine®, thus the title of our presentation, “Coatings in the Modern Era for Small Carriers.”

MAXIMIZING ROI

With MarineLine®, the shipowner has the ability to maximize their earning potential in a number of different ways:

1. Because the coating is nearly impermeable, it limits the possibility of cross cargo contamination and maintains product purity from port to port. By eliminating this risk it protects the owner from the potential loss of earnings. Avoiding cargo contamination is a primary concern of any chemical or product tanker operator. Consider the expenses involved when claims are put forth – paying for the replacing the cargo, paying for someone to take the tainted cargo, and laying up the ship (off-hire) while the litigation and inspection drags on. These claims can take weeks and even months to resolve, costing the owner millions of dollars in potential earnings, because of cargo contamination.

2. MarineLine's near impermeability, combined with its ultra smooth surface allows the cargo tanks to be cleaned faster then other types of cargo tank coatings. This eliminates the need for extensive cleaning chemicals, long ventilation times, and other special cleaning requirements that can cause excessive downtime and costs.

3. In addition to not needing extensive cleaning chemicals, fuel consumption can be minimized for the operation of cleaning equipment, which saves costs and reduces emissions.

4. Faster turnaround in port means the potential for more days in service and higher profitability for the ship owner.

Conventional coatings such as zinc and epoxies have limitations in cargoes and cleaning requirements. These limitations are based upon their chemical structure and ability to absorb cargoes.

For instance, traditional cleaning chemicals can destroy zinc coatings (shown on the picture to the left) when cleaning from a dyed gasoline, gasoil, or vegetable oil to Methanol or MEG. In addition it takes an extensive amount of time and effort to get the tanks clean.

Epoxy coatings have very high absorption properties, especially with a product such as Methanol, and have high restrictions for cleaning and cargo loading. For instance Methanol is not normally loaded after carriage of styrene monomer or EDC for 3 cargo cycles. In addition there are strong cargo restrictions on the carriage of edible oils and other sensitive chemicals. (Photo shown left is an one year old epoxy-coated tank that has carried Methanol).

While stainless steel tanks have provided some of the answers to carrying sensitive cargoes for years, there

are limitations and costs associated with the maintenance these tanks. There is the high initial cost of construction, followed by the ongoing costs of maintaining tank conditions through passivation and cleaning. Passivation of the tanks is expensive and dangerous, however is necessary at various points throughout the cargo tank's life cycle. In addition, stainless steel has inherent problems with chloride attack, thus making cleaning the tanks costly because you need to use fresh water or treated seawater. Stainless steel's inherent problems with chlorides also limits its ability to carry certain cargoes.

A BETTER APPROACH

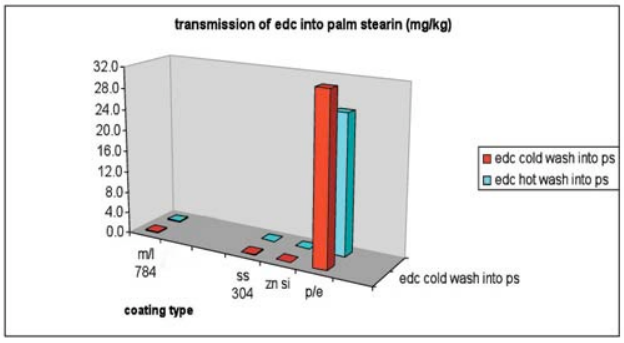
MarineLine® has provided a solution to these problems for more than decade by providing a coating with less limitations than conventional coatings and at a less expensive cost than stainless steel. Independent laboratory testing has shown MarineLine® to be equal if not better in its cleaning properties and chemical resistance. Recent independent laboratory test compared MarineLine® to epoxy, stainless steel and zinc coatings in cargo retention.

INDEPENDENT TESTS COMPRARE MARINELINE® VS. STAINLESS STEEL, PHENNOLIC EPOXY AND ZINC SILICATE COATINGS FOR CARRYING VEGETABLE/EDIBLE OIL CARGOES

In 2008 Marinspec Associates (MA), an independent testing laboratory based in the UK, investigated the absorption and retention of chemical cargoes in organic cargo tank coatings prior to the carriage of vegetable oil cargoes.

In 2009, MA then compared the transmission characteristics of MarineLine® 784 against a typical zinc silicate coating, a typical epoxy phenolic coating and stainless steel. The following surfaces were evaluated:

- Mild steel coated with an industry standard Ethyl Zinc Silicate coating
- Mild steel coated with an industry standard Epoxy Phenolic coating
- Mild steel coated with MarineLine® 784 coating
- Stainless steel, grade 304



MA investigated the cargo absorption (and retention) characteristics of each of the 5 surfaces under the same operational conditions with a view to comparing the contamination threat each surface posed, after exposure to Styrene Monomer (SM) and Ethylene Dicholoride (EDC), to subsequently loaded ambient temperature and high melting point vegetable oils. The objective was to compare MarineLine® coatings against stainless steel and inorganic coatings under the International Industry Rules for the carriage of Edible Oils in ship's cargo tanks. (eg EU, FOFSA, NIOP etc).

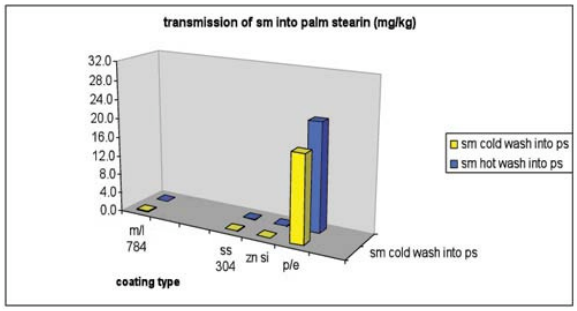
The conclusion was clear; MarineLine® out-performed the phenolic epoxy and matched the performance of stainless steel and inorganic coating in ensuring edible oil purity when tested respectively with Styrene Monomer and EDC as immediate last cargoes.

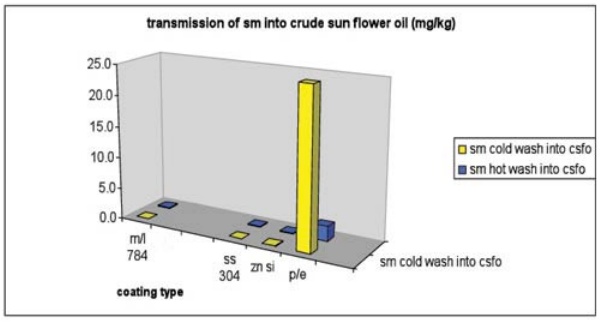
RESULTS

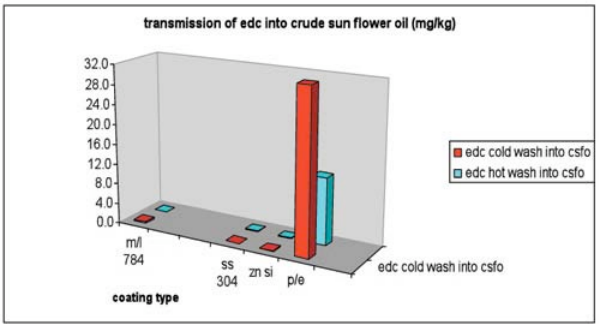
1. The surfaces posing the least threat to the vegetable oils were MarineLine, Stainless Steel 304, and industry standard Zinc Silicate and with results reported from the laboratory being below the detection limit (2mg/kg) of the analytical equipment. However, it is important to note at this point that the stainless steel used in this project was new stainless steel, which was degreased and fully passivated prior to exposure to the chemical cargoes. Similarly, the zinc silicate used was a newly applied coating, which was washed in fresh water, dried, washed in clean toluene, and dried again, prior to exposure to the chemical cargoes. As such, these two surfaces can be considered to be in "new" condition. Had these two surfaces been in a "used" condition, their performance may have been different.

2. MarineLine® 784 performed in much the same way reported in the first testing. The laboratory results for Styrene Monomer being consistently below the detection limit (2mg/kg) of the analytical equipment. The laboratory results showed very slight traces of EDC in the vegetable oil samples that were exposed to the panels that had been washed in the "cold" washing procedure (it should be noted that the panels that were "hot" washed, did not show any traces of EDC in the vegetable oil samples), but even so, after the results were adjusted to a surface area to volume contact ratio of 1 : 1, they were equivalent to a contamination threat of less than 0.30 mg/kg.

3. The surface posing by far the greatest threat was the industry standard epoxy phenolic coating. The results for transmission of both chemical cargoes show very similar trends to those reported in Marin 02/08 – FOSFA International reaching a maximum of 25.1 mg/kg for Styrene Monomer and 45.0 mg/kg for EDC.







For more information on the MarineLine® coating system, visit www.adv-polymer.com