ADVANCED POLYMER COATINGS

Mid-life polymer recoating projects **offer clear operational advantages**

Material science and a molecular-level understanding of surface integrity are driving measurable gains in chemical tanker efficiency, emissions performance and trading flexibility.

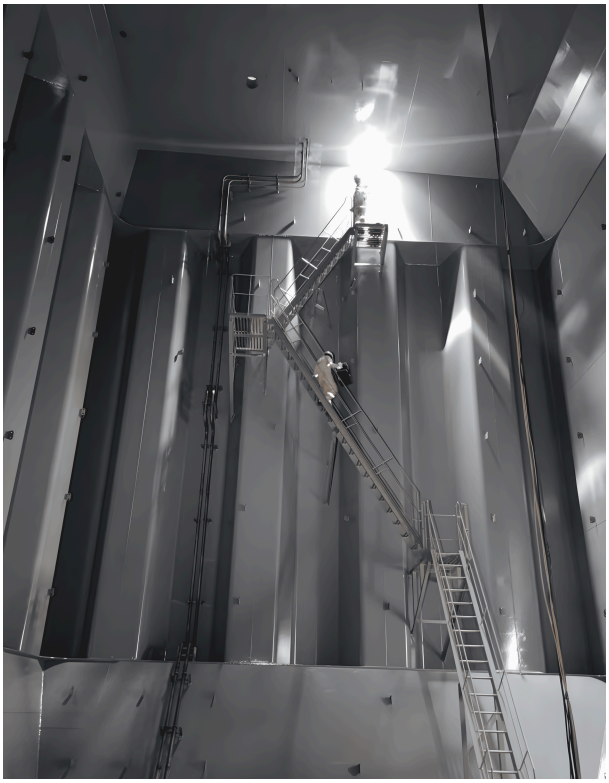
Tank coatings are one of the most operationally critical, yet often underestimated, determinants of chemical tanker performance, and for medium-range vessels, particularly those entering mid-life, the commercial and environmental limitations of their traditional cargo tank coating systems are becoming increasingly apparent.

Market competitiveness depends on the ability to carry diverse chemical cargoes, including aggressive, high-specification products. Current coating systems, such as bisphenol phenolic epoxies and zinc silicates, can hinder operational efficiency due to higher surface absorption and more intense tank cleaning requirements.

Recoating at mid-life: resetting market agility

A recent mid-life recoating programme involving six Ardmore Shipping product and chemical tankers provides a useful reference point for examining how advanced polymer cargo tank linings can address these challenges.

The Ardmore vessels involved include two South Korean-built 37,764 dwt D Class tankers, Ardmore Defender and Ardmore Dauntless, and four Japanese-built C Class vessels: the 25,217 dwt Ardmore Cheyanne, the 25,215 dwt Ardmore Cherokee, the 25,233 dwt Ardmore Chinook and the 25,211 dwt Ardmore Chippewa.



MarineLINE® heat cured coating on Ardmore Defender 1

They are all approximately ten years old and were originally delivered with epoxy-coated cargo tanks. While such systems remain widely used, owners increasingly report constraints when trading aggressive cargoes such as methanol, free fatty acids (FFAs), vegetable oils and certain biofuels.

Recoating was carried out at Chengxi Shipyard in China using the MarineLINE® cargo tank coating system developed by US-based coatings specialist Advanced Polymer Coatings (APC). MarineLINE is a heat-cured polymer coating designed to form a tightly bonded, non-porous lining with exceptionally low permeability.

An operator's perspective

From an operational perspective, mid-life recoating allows owners to reset coating condition, extend service life and fundamentally change a vessel's trading capability, without the capital expenditure associated with a new fleet.

"We have initiated a chemical fleet recoating programme to ensure that the vessels remain fully competitive in high-specification chemical trades," explains Cristin Nutu, Cargo Manager, Ardmore Shipping. "The upgrade to MarineLINE marks a significant step in our long-term strategy to deliver tangible operational benefits, including cargo sequence planning and port discharge turnarounds.

> *"We now have greater cargo versatility, as MarineLINE supports a wider range of chemicals, including demanding, high-specification grades. As a result, our fleet can pursue a broader set of backhaul cargoes and repositioning options, capturing favourable freight economics and reducing exposure to 'ballast-only' legs when market conditions shift," highlights Nutu.*

"Reduced cleaning times can also drive secondary benefits," Nutu continues. "We will use fewer chemicals and less water, along with shorter steaming, and port stays related to tank readiness will decrease workloads and the pressure on crew, lowering the total cost of operation across the cargo cycle."

Ardmore also highlights the importance of expert intervention during the recoating projects. "We greatly appreciated the technical support provided by APC throughout the completion of all six projects in China," adds Suraj Batra, Senior Manager Fleet Operations, Ardmore Shipping. "On-site technical presence played a key role in resolving any challenges efficiently."

Surface absorption: the hidden constraint

Peter Stoyles, Global Marine Sales Manager, APC, notes that recoating projects are increasingly driven by operational barriers and loss of trade rather than coating age alone. "We are often brought in because existing coatings are struggling to cope with aggressive cargoes such as methanol and FFA," he says. "Owners have missed spot trades because cleaning and ventilation have taken too long, or they simply couldn't prepare the tanks in time."

At the core of the issue is surface absorption. To varying degrees, molecules can penetrate the coating structure of traditional epoxy coatings, driving longer cleaning cycles, ventilation times and higher energy consumption. "They can act like a sponge," Stoyles explains. "This absorption directly reduces a vessel's availability for spot market trading."

MarineLINE's technical differentiation lies in the density of its cured polymer surface. Heat curing creates a tightly knitted molecular structure comprising up to 784 cross-links, forming a chemically inert barrier.

"Once fully cured, the lining does not allow cargo molecules to permeate the surface," Stoyles adds.

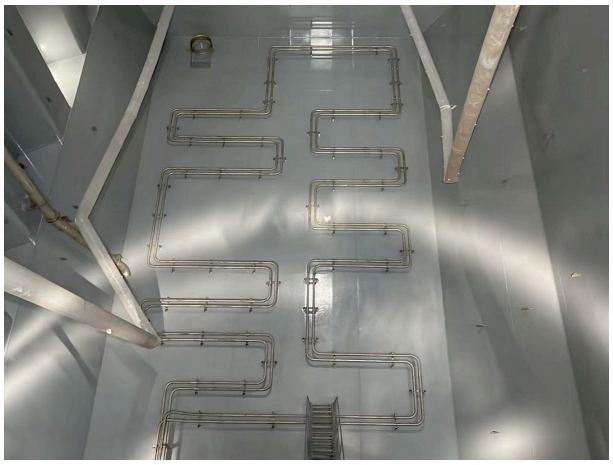


Applying MarineLINE® base coat to the Ardmore Chinook

Cleaning efficiency, emissions and availability

The operational impact of reduced absorption is most clearly seen during tank cleaning. APC estimates that a chemical tanker with premium epoxy-coated tanks carrying methanol, for example, may require seven to ten days for cleaning and ventilation before the next cargo. With MarineLINE, this can be reduced to approximately three days.

“Even at the most conservative end, that is four days of continued emissions, as a vessel in port is still burning fuel, four days of off-hire time and four days where the vessel simply can’t trade,” says Stoyles. “When you extrapolate that across a year, or across a vessel’s lifetime, the financial and environmental implications are substantial.”



MarineLINE® coating undergoing final heat cure process

The majority of energy consumed during tank cleaning is used to heat water. Faster cleaning cycles therefore translate directly into reduced fuel consumption, lower emissions and improved Energy Efficiency Operational Indicator (EEOI) performance.

“If a vessel has greater operational or product flexibility and can complete a return leg with cargo rather than ballast, that positively impacts EEOI,” Stoyles notes. “A lower EEOI can support stronger charter terms and higher daily rates.”

In fuel oil cleaning operations, where hot water washing and chemical treatments typically take two to three days, APC estimates that MarineLINE can reduce cleaning time by up to quarter, equating to increased vessel availability, and multiple days of fuel savings over the course of a year.

MarineLINE is installed on approximately 700 vessels worldwide. In terms of lifetime performance, for high-specification chemicals, MarineLINE typically achieves a service life of seven to ten years, while in clean petroleum product trades some installations have exceeded 20 years.

Commercial implications for medium-range tankers

“The medium-range chemical tanker segment is emerging as a particular ‘sweet spot’ for polymer coatings,” Stoyles points out. According to APC’s operational modelling, a 25,000 dwt tanker fitted with MarineLINE can earn a considerable premium due to increased availability and cargo flexibility.

“Operators trading in the spot market benefit from faster turnaround times,” he says. “If you can clean quicker, ventilate faster and accept aggressive cargoes, you are simply more available to take that trade.”

Ardmore confirms this observation. “This recoating strategy is about keeping our ships ready for what the market demands today,” Nutu says. “Speed, flexibility and the ability to handle challenging cargo sequences are critical to capturing favourable freight economics.”

“Overall, the collaboration with APC has been very positive,” Batra concludes. “The recoating programme has strengthened our operational readiness and supports how we want to deploy the fleet going forward.”

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