

What is the best tanker coating?

Keith Forward reviews the latest developments in tanker coatings, including vinyl films, coatings you can apply underwater and tin free anti-fouling

When deciding on a newbuild paint specification there are a lot of parameters to take into account to ensure the best mix of initial cost versus performance over the vessel's lifetime.

It depends on how long the owner intends to run the ship before selling it on, climatic conditions of operation, the shipyards preferences, among other factors. Some coatings last longer than others and some coatings make the vessel look better than others.

One of the biggest advances in recent years is the development of universal primers that can meet the needs of virtually every area on the vessel, including underwater hull, cargo oil tanks, and topsides.

You no longer need separate products for different areas such as the ballast tanks, superstructure and hull.

This results in savings through lower labour costs and simplifies the choice.

Coatings manufacturer Hempel provides the following summing up: "Look for a simple, high-quality newbuilding paint specification, with as few coatings specified as possible.

"This will make it simpler for the shipyard's logistics handling, will increase the production rate, make the applicator more familiar with the product, reduce the overall consumption, reduce waste, make it easier for the on-site attendance team (shipyard QC, owners representative, paint manufacturers coating advisers, class surveyors)."

Appearance

Cosmetic appearance of vessels is often not a very high priority with budget conscious tanker operators, but many ship managers and certainly the oil majors are realising that image is a vital selling point where customers are concerned.

A vessel with discoloured, peeling coatings can reflect in a negative way on the perceived safety consciousness and reliability of the operator.

With developments in coatings technology, there is less of a compromise than there used to be between costs and the appearance and lifetime of the product. New products offer a higher resistance to fading and mechanical damage, while the higher costs are normally offset by lower maintenance requirements.

Pure or modified epoxies

It is difficult to compare the differences between the wide range of modified epoxies, pure epoxies, high solid epoxies and various other designations that appear on the market.

The wealth of operational data supplied by manufacturers suffers from hidden variables that affect one vessel but not another.

International Marine Coatings (IMC) see aluminium pure epoxies as offering protection "an order of magnitude" better than modified epoxies, and therefore paying back the higher initial investment through years of lower maintenance costs and trouble free performance.

IMC cites independent research carried out by Norway's SINTEF Materials Research group showing that, "after 18 months continuous immersion in seawater with a normal protection voltage of -1050mV, aluminium pure epoxy systems showed no loss of adhesion around an artificial area of damage, while modified epoxies (also

loaded with aluminium) suffered from blistering and loss of adhesion around the area of damage."

However according to Hempel, "one must be careful in the evaluation of epoxy products and base the evaluation on more than just the classification between 'pure' and 'modified'.

Pure epoxies may have excellent anti-abrasive properties, but also modified epoxies have very good anti-abrasion properties and serve well under harsh conditions, e.g. as a cargo hold coating in bulk carriers.

Consequently, anti-abrasion resistance can be achieved by both pure and modified epoxy.

In fact, Hempel states, "It is only when there is a need for a resistance to high temperatures such as in chemical tankers transporting high temperature cargoes that the 'pure epoxy' may have an advantage over the 'modified epoxy'."

So while the owner is not losing out in terms of protection by opting for a pure epoxy, it may nevertheless be possible to employ a high quality modified epoxy from a trusted supplier at lower cost, while still enjoying modest maintenance costs.

Nowadays, the choice is more likely to be influenced by ease of application and lower labour costs as well as the lifetime performance of the coating.

Underwater painting

Can you paint ships underwater?

Modern epoxies designed for application in wet conditions will bond with a surface even if it is saturated or actually submerged, making the seemingly ridiculous technically possible.

This is because air and water are basically both fluids, although of very different properties, and painting basically involves applying a coating to a surface that displaces the fluid surrounding it (usually air) to bond closely with that surface.

Therefore painting underwater is really not technically so different, although the coating does have to be designed with the application medium in mind.

In the past, underwater coatings were rather unfriendly products, both difficult to apply and toxic to the user (and requiring hazardous cargo transfer adding to the cost).

This situation improved with better bonding technologies that eased application, but storage and toxicity were still problematic. The latest range of epoxies are environmentally safe, will remain stable in storage not crystallizing over time and are easy to apply in a wider range of conditions.

These products are applicable both to submerged areas and for surfaces that are saturated and would require an unacceptable amount of time to dry out. Thus they are suitable for a range of repair and maintenance jobs onboard a vessel where water is present and would be expensive or inconvenient to remove.

One of the only problems that can occur with underwater epoxy application is if the surface has an underlying electric current is present.

This is because the coating relies on small electric charges to bond to the surface, and these are disrupted when there is an electric field present

This results in the paint being unable to transfer from the applicator to the surface, and so areas must be tested for electric charges before a job is undertaken. This is of course particularly applicable in the maritime field where almost everything is constructed of metal.

So underwater painting can be a viable option for marine repair jobs on a commercial scale and may even help to postpone a visit to the dry-dock.

Orca vinyl paint

Orca Maritime in Norway has developed a coating system that uses a vinyl film to provide a water and airtight barrier that prevents corrosion and is resistant to most chemicals.

The film has been undergoing trials with several shipowners over the past two years and is now starting to enjoy a deserved commercial success after its official launch in 2002.

Orca claims that this system is cheaper to apply than paint, offers better resistance to corrosion, and is less damaging to the environment on the principle that there is no vapour release or leaking of chemicals.

It also offers evidence that the cosmetic appearance of vessels coated with the film is substantially better than with a conventional coating, while actually lasting up to three times longer.

The product is basically a cadmium free vinyl polymer of 80-100 microns thickness with an acrylic adhesive applied to one side.

Application is simple, just a matter of peeling off the backing and sticking it on the side of the vessel, and is faster than a normal coating, with no drying time between applications.

It is much more user friendly due to the lack of fumes and protective clothing is therefore not necessary. The company is now offering a four-year warranty against cracking, blistering and peeling.

The idea came from the observation that the area under a vinyl logo was much better preserved than other areas of the hull.

This led to the development of a suitable vinyl film that could meet the demands of maritime use, the 9800HT offshore film, and subsequent testing on the North Sea oilrig "Brage".

The results showed that after 5 years in service the film was in good condition with a glossy surface, while conventional paint applied at the same time was dull and ready for a recoat.

Orca Maritime estimates that the film will stand 10-12 years of service, which is 2-3 times longer than most conventional systems.

It also claims that maintenance costs will be reduced by 50-70% over ten years, both because of the longevity of the product and the ease of patching up damaged areas. In trials, the application time was around 50% less than for a normal coating, which is a huge saving.

One of the areas Orca improved on when developing the film from the original vinyl logos is the glue used to apply the product.

This is a high performance acrylic based, pressure sensitive adhesive that protects the surface even when the film itself is damaged. It was developed specifically for maritime applications and prevents corrosion spreading when a break in the film occurs, limiting repairs to the immediately affected area.

An application that has found a niche market for the product is its use on fast ferries. The film results in a weight saving of up to half a kilo per square meter, which on a 5000-m² ferry is a saving of about 2.5 tonnes.

Several companies have started refurbishing their ferries with film instead of paint, including the Stena Line ferry "Carisma" operating from Gothenburg to Denmark, and Aboitiz in the Philippines.

The cosmetic properties of the film are also superior to many paints, with some fading occurring only after about 6 years.

In tests on the oil rig the glossy appearance was maintained after five years, which also helped to keep surfaces clean as they could be easily wiped down.

Obviously this is also of special advantage in image conscious applications such as cruise and ferries.

The environmental benefits from replacing coatings with film are also apparent. Since the vinyl is essentially inert and resistant to many chemical agents, there is no leakage of chemicals over time as can occur with paint.

The application process is dry, without solvents or vapours, and therefore minimises risk of contamination and occupational hazards.

It is also fire resistant, and even if it does burn does not release any toxic fumes.

Chugoku

Chugoku Marine Paints Ltd. (CMP) has developed a system called Chugoku's Innovative Technology (CIT) which consists of 6 coatings that can meet the need of an entire newbuilding project, resulting in savings through lower labour costs (Chugoku claims up to 40% lower costs).

Chugoku counts over 3500 newbuildings using its Sea GrandPrix anti-fouling range, with largest market share coming from Japan where it claims 60% of the market. The latest order comes from P&O Nedlloyd, with 9 newbuildings at Hyundai Heavy Industries in Ulsan, Korea. Chugoku claims one of the main reasons why P&O Nedlloyd chose CMP for this project is its leading expertise in tin-free antifouling. The latest addition to the range is Sea GrandPrix Eco-speed. This is an ultra-smooth coating that does away with the need for toxins to keep organisms from fouling the hull.

It uses a silicon-based resin with CH₃ methyl groups on the surface, which are very chemically inert and slippery, meaning the glues from shell creatures do not adhere well. This prevents build up of fouling, and means anything stuck to the hull can be more easily wiped away.

The surface profile of the paint can be seen under the microscope to be virtually smooth, "like a mirror", unlike standard self-polishing anti-fouling solutions that have a roughness of around 125 micrometers. The technology comes from 20 years experience of using silicone foul release technology in the industrial sector, and the migration to maritime is a natural one that maybe is surprising not to have come sooner.

The slippery surface also results in benefits to fuel consumption, and speed through the water.

Chugoku has developed two products for different speed requirements; Sea GrandPrix Eco-speed is for vessels trading over 15 knots while Seajet Eco-Speed C suits vessels trading under 15 knots. CMP also uses special binder coat technology to ensure a better application of several coats of paint, and anti-sagging technology for a thicker coat.

Hempel

Hempel is keen to stress, "a penny extra spent on newbuild can save dollars in maintenance costs."

Its latest universal primer helps keeps down costs while providing "excellent corrosion protection and abrasion resistance for all areas both wet and dry." It is a high solid pure epoxy that is polyamide/amine cured and comes in two versions, designed for winter or summer use.

HEMPADUR UNIQ 4774 is already in use for all areas of 4 115,000 tdw crude oil tanker newbuilds at Daewoo Shipbuilding and Marine Engineering in Korea.

IMC

IMC, part of the huge Akzo Nobel group, has introduced two new marine finishes designed to maintain gloss and colour appearance for external above water areas. Both are isocyanate free and for use at newbuilding, maintenance and repair, with low VOC emissions and high resistance to mechanical damage.

IMCs new flagship high performance product is Interfine 979, a high durability coating designed predominately for image conscious operators and therefore vessels such as Cruise Ships, Passenger Ferries, Ro-Ro Vessels, Government Vessels, Container Ships and Reefer Vessels.

This uses patented inorganic polysiloxane technology that is based on a silicon-bonded finish, in contrast to epoxies and polyurethanes that are carbon based and therefore organic compounds.

The silicon bond is relatively less chemically active and therefore more resistant to attack by ultraviolet radiation from sunlight, one of the main causes of fading and loss of gloss and colour.

The tough chemical bonds also help to improve its resistance to mechanical damage, and used in conjunction with a high performance primer (IMC's product is Intershield 300) can give improved cosmetic appearance in conjunction with improved corrosion protection. The product was originally developed for the offshore industry and has now been launched worldwide for general maritime.

Interfine 691 is an epoxy acrylic coating that offers equivalent performance to typical recoat able polyurethane finishes. It is designed for application where the higher durability of Interfine 979 is not needed, and is now available in Europe only.