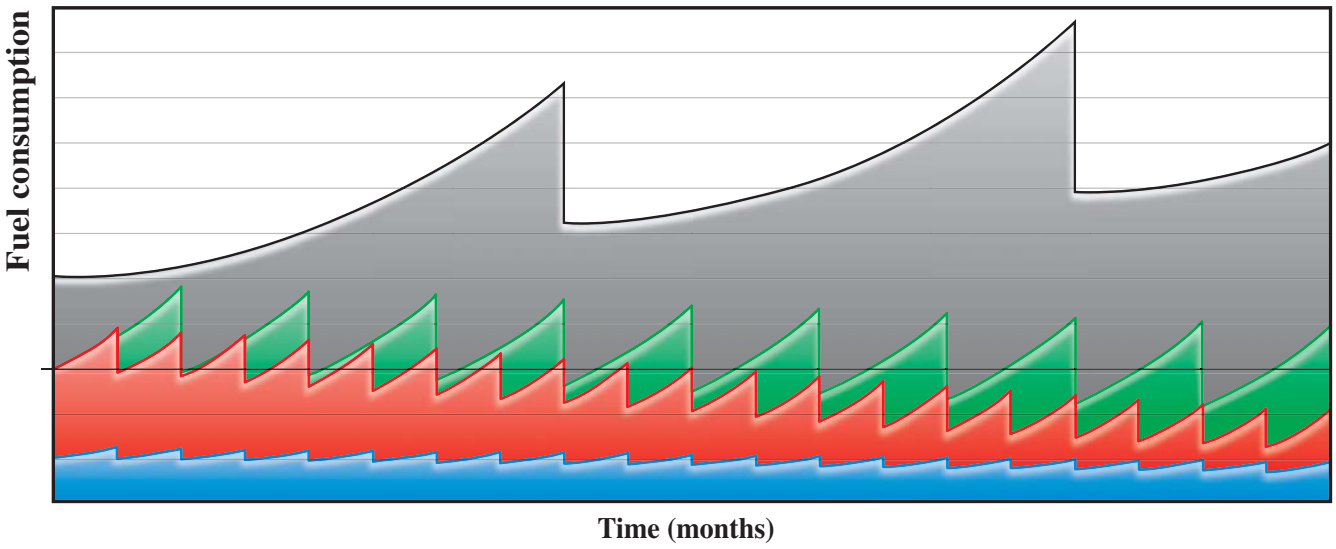
ECOSPEED®

SHIP HULL PERFORMANCE TECHNOLOGY

Magazine

Millions in fuel savings

Development of additional fuel consumption over time



Ecospeed with 2 cleanings per year
Ecospeed with 4 cleanings per year
Ecospeed with optimum cleaning intervals
Active antifouling paints

Most ships sail with a chartering contract that includes a penalty clause if fixed distance/fuel consumption ratios are not met. However, this is unpredictable with regular paint systems and will also worsen over the years. The ship becomes more expensive and profits are reduced.

The protective Ecospeed ship hull performance technology however not only keeps the ship's performance stable but even improves it with repeated underwater maintenance. The coating is designed to be cleaned routinely with specially designed underwater hull cleaning tools. These simultaneously clean and improve the smoothness of the paint surface. This avoids penalties as well as producing enormous fuel savings.

One major cruise line has been quoted as saying that they are saving 10% on fuel costs with Ecospeed compared to the earlier TBT coating which they replaced. Another cruise ship found that they gained 1.5 knots over sea trials speed when they replaced their hull coating with Ecospeed.

Contact us to find out how Ecospeed can help you achieve major fuel savings.

EU Office
Phone: + 32 3 213 5318
Fax: + 32 3 213 5321
info@ecospeed.be

US Office
Phone: + 1 727 443 3900
Fax: + 1 727 443 3990
info@ecospeed.us

www. ECOSPEED® .be

Preventing corrosion of ships' hulls, tanks and running gear

Part II: The solution and the savings

Effective marine corrosion protection

In Part I of this article, published in a recent Ecospeed Magazine, we covered the theory, cause, effects and cost of corrosion in ships. We narrowed the problem down to its weakest link, which is the coating used to protect the steel or other metal used in the construction of the hull or tanks of the ship. In Part II we look at the best possible type of coating for corrosion protection for ships' hulls and running gear and how much money can be saved with the right protection.

It may seem fanciful to say that the solution is available and is not even difficult, but this is in fact the case. The key to solving the corrosion problem on ships' hulls and inside ships' tanks lies in the coating. A coating that provides an effective, long-lasting barrier between the steel and the corrosive elements such as seawater or various liquid cargos and does not fail is the simplest and most far-reaching answer to significantly reducing if not entirely eliminating the threat of corrosion on the hulls and in the tanks of vessels. This represents a huge saving in many different ways which will be examined later.

If the steel or other metal can be fully coated with a tough, durable, impermeable and impenetrable coating which stays on for the life of the hull, then the corrosion problem is solved.

But what coating would that be?

Most coatings used on ships are based on organic resins. The resins commonly used in coatings include alkyds, epoxies, vinyls, polyesters, vinylesters, epoxyesters, urethanes, acrylic polymers, chlorinated rubber and others. But all organic coatings will, to some extent or other, permit fluids (liquid or gas) to pass through them.

Epoxies are in wide use because they form a thick coating, have generally good resistance to chemicals and corrosive substances, particularly alkalis and are easy to use. Epoxies have many advantages. However, they tend to become brittle over time. A brittle coating will fail because it is unable to cope with the flexing of the hull plating and can therefore disbond as it ages. If one is looking for a long-lasting protection for the hull then polyester or vinylester are more effective.

However, as has been stated, all organic resin coatings are to some degree permeable, transfer water or water vapor and other chemicals and therefore are not capable of providing a complete barrier.

How can one then protect the steel sufficiently to entirely prevent corrosion?

Glass

Glass is completely impermeable to liquids. It is entirely resistant to chemicals, acids, alkalies or salts. It is a complete electrical insulator.

Unfortunately, despite all these wonderful properties, and the fact that one can entirely cover a metal with glass by fusion as in enamel, it is too rigid, brittle, fragile and expensive to be used in coating hulls and tanks to prevent corrosion.

The question is (or was) how to combine the valuable properties of glass with the tough, adhering and resistant qualities of the better resins?

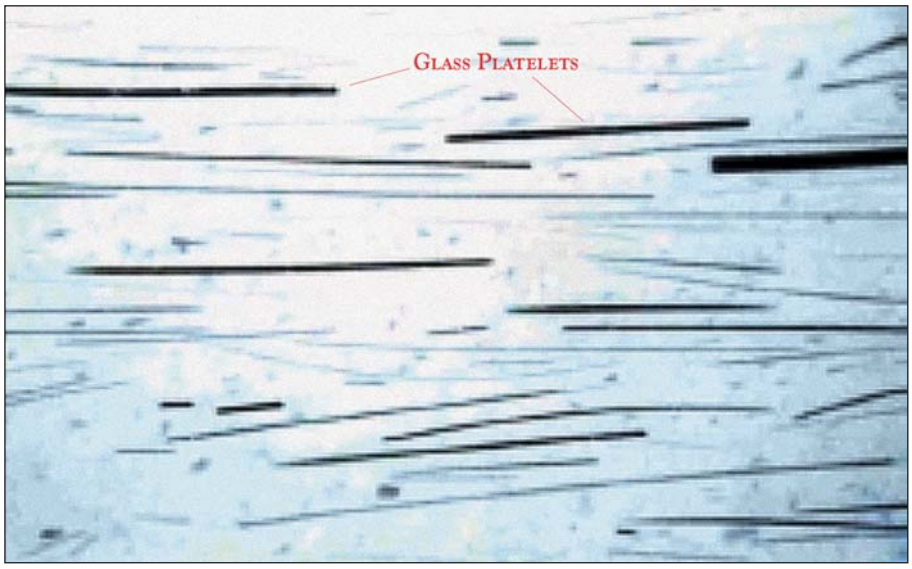
The answer is glassflakes.

Glassflakes were introduced into coatings around 1960. Since then they have gained popularity and have been used with a number of resins (polyester, epoxy, vinylester) in many applications including marine corrosion protection, inside and outside ships.

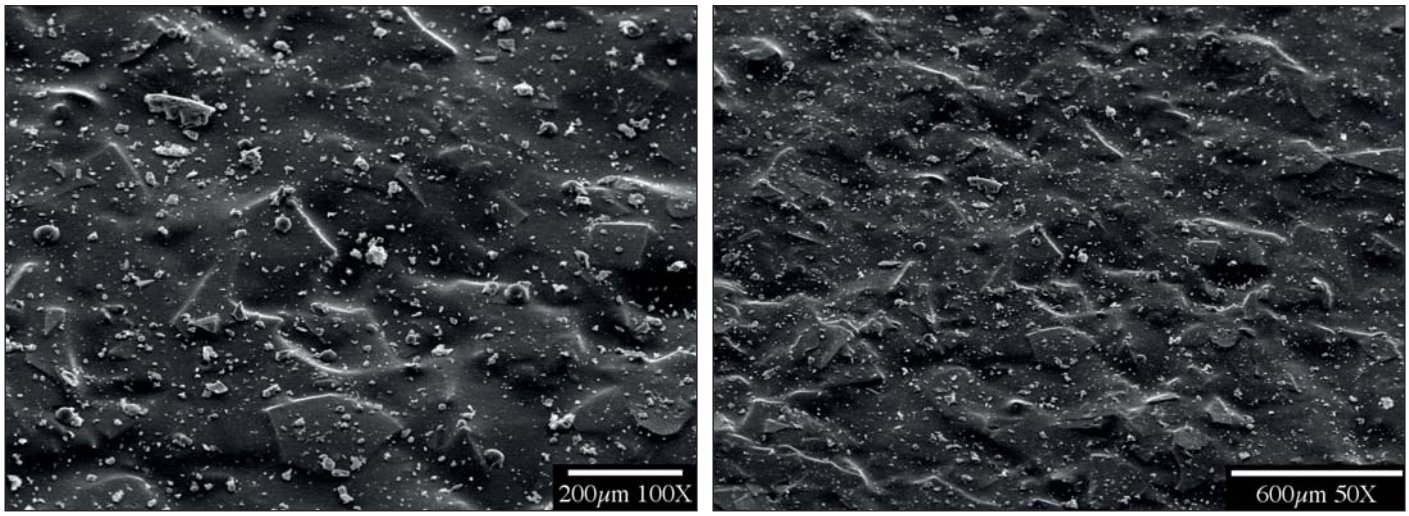
By combining relatively large flakes of glass in a resin base in such a way that the flakes overlap each other, adhering firmly to the resin, in a fairly thick coating, one can achieve an impenetrable barrier which can protect steel from all the corrosive elements faced by ships, both on the outside of the hull and on the inside of ballast and cargo tanks.

The type of coating which is best suited to protecting steel or other metal from corrosion in ships' hulls and tanks is a glassflake reinforced resin. If the very best glass flakes and resins are used and are applied in sufficient thickness, they can easily protect a hull or a tank for 25 years or more without the need to replace the coating or carry out any more than minor repairs when it is mechanically damaged.

However, not all glassflake is equal, nor are all glassflake reinforced coatings, a number of which exist. While the chemical composition of such coatings is usually proprietary and a well-kept secret, the best of such coatings combine a long-lasting, non-brittle organic resin with high quality, fairly large glass flakes. There are different ways of making glass flakes and the size and aspect ratio of these flakes vary considerably. Another use of glass in such coatings is ground or micro-



Microscopic images of a high quality glassflake reinforced coating showing a high content of glass flakes with a large aspect ratio.



Microscopic photos of the surface of a glassflake reinforced coating.

Gritblasting a hull prior to application of a glassflake coating.

SA 2.5 clean surface and a 75µm profile or more is needed for real corrosion protection.

nized glass which serves little purpose in creating an impenetrable and impermeable coating and should be avoided if you are looking for real protection for your ship's hull or tanks.

Traditionally, such glass reinforced coatings have the longest life and offer the greatest protection against corrosion of any type of coating. They can be used on the outside underwater hull of a ship, on the underwater gear such as rudders (they have the additional property of preventing cavitation damage to steel), stabilizer fins, nozzles, bulbous bows and other parts of the ship which are completely immersed. They can also be used inside ballast and cargo tanks. They can and should be used on the splash zone.

But it is not enough to simply specify a "glassflake reinforced coating," and hope that the rest of the details will take care of themselves. The success of glassflake reinforced coatings on the hulls of ships and inside ballast and cargo tanks depends on several factors:

1. type of resin

2. type of glassflake (type of glass and method of manufacture)

3. size and aspect ratio of the flakes

4. relative proportion of flakes to resin

5. the use of coupling or bonding agents to improve adhesion

6. the overall formula of the coating taking all the above and other factors into account

7. the thickness of the coating

8. the preparation of the surface to be coated (profile and cleanliness achieved prior to application)

9. the application itself (quality of application, conditions under which it is applied)

The finished surface. The ripples enchance hydrodynamic properties.

Underwater cleaning of a glassflake surface treated composite (STC) coating can easily be done without damage to coating or environmental hazard.

10. the maintenance of the coating during the life of the vessel, consisting of routine in-water cleaning, and minor touch-ups of any damage to the coating during routine drydocking.

If care is taken to optimize all of these points, a near ultimate in corrosion protection can be achieved for the life of the vessel so protected.

(Note that these points are covered in detail in Hydrex White Paper 13, Conquering Corrosion in Offshore Vessels which is available from Hydrex upon request.)

Benefits

A high quality, special glassflake coating of this type (known as a Surface Treated Composite or STC) offers many advantages in terms of corrosion protection both on the external hull and inside ballast and cargo tanks of vessels. These benefits can be summarized in terms of longevity, economy, safety and environment.

1. A high quality, properly applied hull coating or tank coating of the type described above can provide protection from corrosion for 25 years or longer without need for drydocking to repair or replace the coating.

2. It will make the costly replacement of corroded steel unnecessary. This has a major impact of total ownership cost when one factors in the cost of the materials and labor, the expense of drydocking and the off-hire time avoided.

3. If the coating is damaged mechanically, undercreep corrosion is virtually nonexistent due to the very high adhesion level. Thus corrosion does not spread and the integrity of the coating is not compromised.

4. Although such a coating can be and often is used in combination with cathodic protection, the work needed from the cathodic protection system is usually negligible, sacrificial anodes hardly losing any material, impressed currents kept very low.

5. This type of coating can be cleaned as frequently as needed in the water without damage to coating or hazard to the environment. The coating remains as originally applied, becoming slightly smoother over time when the hull is cleaned in the water. Fouling builds up very rapidly and heavily on a stationary structure such as a drilling rig or other offshore production or storage vessel, regardless of the type of coating in use, including biocidal antifouling coatings. Cleaning soft coatings such as AF or FR coatings is not practical for a number of reasons so a hard, cleanable, non-

toxic coating has a great advantage in this respect.

6. Due to its non-toxic nature, this type of coating presents major advantages environmentally. As regulatory pressure increases, this approach represents a very affordable means of remaining compliant. You can actually save a great deal of money, as detailed below, while becoming green, at least as far as non-toxic hull coating and reduced GHG emissions are concerned.

7. The coating is easy to apply since it is sprayed directly onto prepared steel in one, two or more homogenous coats of 500µm each with a short overcoating time.

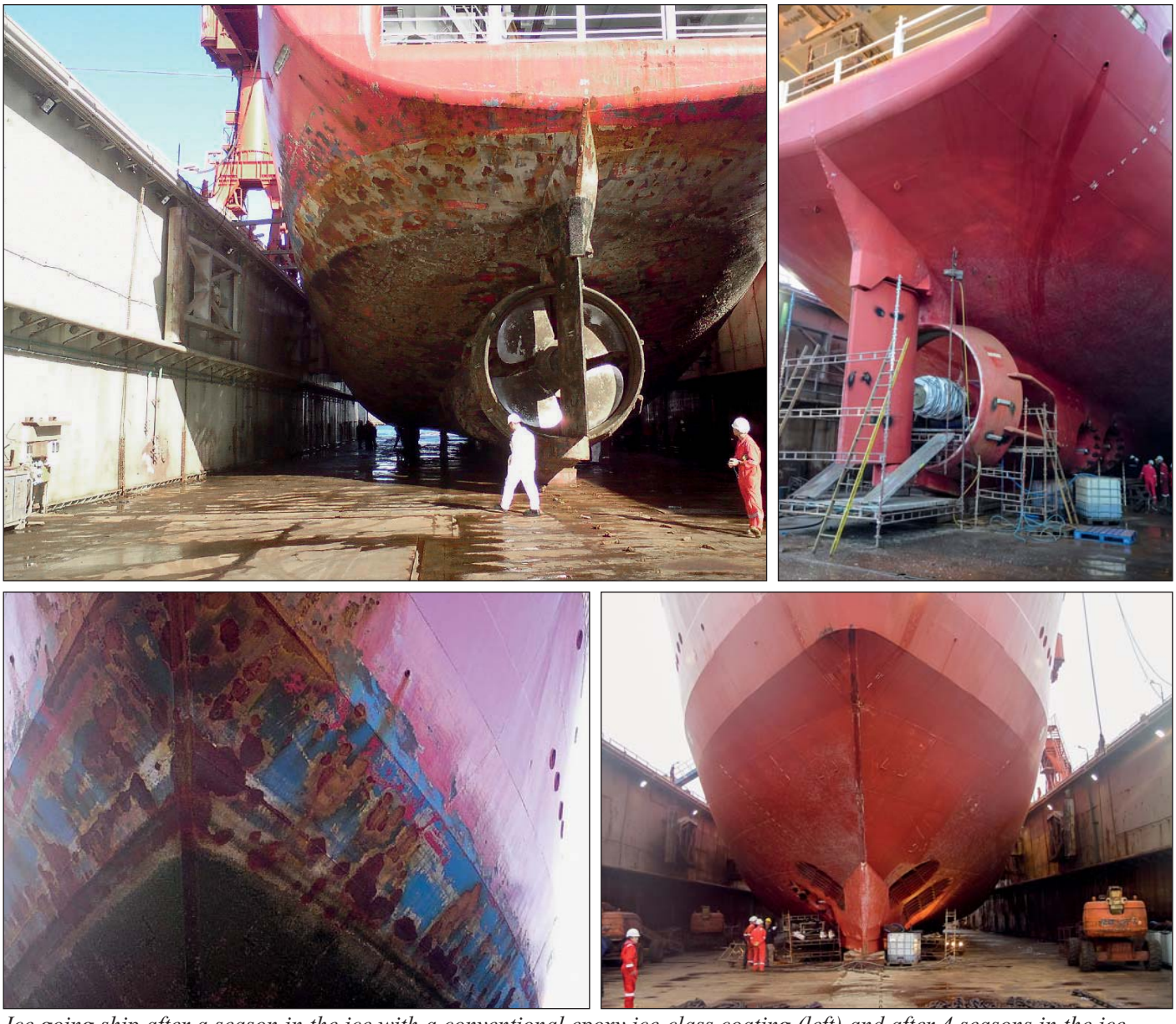
8. The coating has very low VOC content, another advantage from an environmental point of view.

Big savings

There is no need here to go into the economics of shipping. They are well known and have been and continue to be covered exhaustively. Suffice it to say that any money that can be saved is of vital importance to most shipping companies.

The use of an STC such as Ecospeed on hulls and tanks helps shippers save money in many different ways. Taken together and viewed in terms of total ownership costs, these savings are very significant and worthwhile:

1. Fuel savings are the largest single element. By keeping a hull smooth and free of fouling over the life of the ship, the fuel penalty is kept to an absolute minimum and savings are achievable of 10-25% or more compared to the costs incurred from using other types of coatings which deteriorate as they get older and are not suitable for in-water cleaning.



Ice going ship after a season in the ice with a conventional epoxy ice-class coating (left) and after 4 seasons in the ice with Ecospeed (right)

2. The savings from not having to go to drydock to replace steel and to renew or replace the hull coating are also substantial, especially when one includes all the factors involved:

a. drydock fees
b. cost of preparing to drydock
c. labor and materials in drydock
d. off-hire time as a result of the docking.

3. Asset protection. The difference in value between a corroded hulk and a well protected ship hull and tanks after 25 years' service is considerable.

4. The PR and goodwill resulting from a non-toxic hull and reduced carbon emissions due to improved fuel efficiency can be calculated in hard cash for most shipping companies.

5. The additional fact of having an ice abrasion resistant coating on the hull of a vessel which regularly or even occasionally has to steam in ice is another money saving factor.

This is not a full list of all the savings obtainable by using a tough, cleanable STC on hull and in tanks but it is enough to demonstrate that great savings can be achieved.

Ecospeed

Ecospeed is the best known hull coating system which combines a hard, glassflake, corrosion resistant coating with routine in-water removal of fouling. Ecospeed meets all the specifications noted in the earlier parts of this article. This includes certification as an abrasion resistant ice coating and DNV Class B1 rating as a ballast tank coating. It is chemically resistant to a long list of substances including all those likely to be found in the cargo tanks.

Ecospeed is guaranteed for ten years as long as the application is approved by a qualified paint inspector appointed by the company to inspect the preparation and application of the coating, and maintained by a qualified hull maintenance company. This guarantee is renewable if the coating is standardly maintained and cleaned by Ecospeed approved methods. None of these requirements are strenuous and in fact the conditions for the guarantee are simply the conditions that need to be met for the coating to provide protection over the 25 year period envisaged.

Ecoshield

An even tougher glassflake protective coating is available for ships' rudders, thruster tunnels, nozzles and other running gear. Because these parts of a ship are less subject to flexing of steel, the proportion of glassflake to resin can be increased, resulting in an even tougher coating which has proved to withstand the forces of cavitation as well as protecting these parts from corrosion.

The result? No more cavitation or corrosion damage on these parts of the ship which are particularly prone to the forces of cavitation and corrosion.

Conclusion

It may be hard to believe when one reads the government studies on the cost of corrosion, but at least as far as ships' hulls and tanks are concerned, the corrosion problem has been solved and the solution, far from being expensive or difficult, greatly reduces total cost of ownership on any ship that uses it. It is a simple matter to convert a ship to Ecospeed and Ecoshield or, even better, start it off on the right foot at newbuild. ■

Rudder with conventional antifouling coating after 5 years service (left) and the same rudder after 5 years in service with Ecoshield.

ECOSPEED®
SHIP HULL PERFORMANCE TECHNOLOGY

Ecoshield® offers lasting protection against corrosion damage

Over the last few months a number of vessels have had their rudders coated with Ecoshield at shipyards in China and the U.S.A. These include several container vessels, tugs, oil tankers and car carriers. The applications will protect the rudders against cavitation and corrosion damage for the remainder of the vessels' service lives.

Ecoshield application is fast and easy in only two, identical layers.

Some of the owners are returning customers, some are new ones, but all of them experienced the same problem: severe cavitation damage on the rudders of their vessels coated with conventional coatings. The returning customers had seen first-hand that Ecoshield solved the problem on their other rudders and wanted the same protection for the rest of their fleet. The new ones saw the excellent result obtained by other owners and chose Ecoshield to prevent corrosion and cavitation damage from reoccurring.

Thruster tunnels and other running gear can also be protected with Ecoshield.

Cavitation tests in a flow channel, carried out in Grenoble, have confirmed that Ecoshield performs extremely well even under severe cavitation. The coating will prevent corrosion damage from reoccurring on an existing ship or can protect the rudder(s) of a newbuild vessel against cavitation and corrosion damage for the life of the vessel. Ecoshield is guaranteed for ten years As a result of the application no repainting is needed during future dockings.

Proof of this has been given over the last couple of years in numerous

Cavitation damage on rudder before being protected with Ecoshield.

Surface preparation prior to application.

cases. Earlier this year m/v Maersk Deva came into drydock five years after application without having to replace Ecoshield. More recently another container vessel drydocked in Shanghai. The vessel had been sailing with Ecoshield on its rudder for two years and, as expected, the coating was still in excellent condition.

Ecoshield protection for all running gear

Besides offering rudder protection,

Seatrade
AWARDS
2014

Winner of
Innovation in Ship Operations Award

Ecoshield is also suitable for thrusters, azimuth thrusters, azipods, thruster nozzles, kort nozzles, thruster tunnels and other underwater ship gear which needs special protection from corrosion. The extra strength coating protects these areas for the service life of the ship. There is no need for recoating or major repair.

The coating can be applied at the newbuild stage or in drydock for ships already in service. Overcoating time can be as short as three hours, which means that the two coats required can usually be applied in one single day.

Evidence of the success of the product is the number of companies which began by coating a rudder on one ship experimentally and went on to coat other running gear on the same ship and the rudders and running gear of other ships.

Most are converting their entire fleet as a result of seeing the pristine condition of the coated areas after sailing for several years (some up to ten years and counting).

You can give the rudders and running gear of your vessels the same lifelong protection. Contact one of our offices for more information. ■

Ecoshield will prevent corrosion and cavitation damage for the rest of the rudder's service life.

Application of Ecoshield can easily be adapted to the yard's schedule.

Save millions in drydock expenses and off-hire time

Hull of cruise ship after 5 years with Ecospeed coating with no replacement or major repair. This is the state of the hull when the ship came out of the water, without any cleaning or touch-up in drydock.

When your hull coating never needs replacing or major repair, you can save a lot of money in drydock fees, off-hire time, materials and labor.

Most hull topcoats are designed to be replaced once or twice every five years. The full hull coating scheme has to be fully replaced every 10 - 15 years down to bare steel. Over that time period, the coating degrades and becomes rougher until it's no longer worth trying to patch it up. And it costs you a fortune in fuel to compensate for the additional hull friction.

Imagine a coating that's guaranteed for 10 years and is expected to last 25 without replacement or major repair. A coating that gets smoother over time, not rougher.

Imagine coming into drydock after 3 or 5 years and finding that your hull coating only requires a few minor touch-ups and doesn't even need to be washed off.

Just think how much money you will save.

Call us today for a quote to convert your hull to Ecospeed or start off right, with Ecospeed, on a new build.

EU Office
Phone: + 32 3 213 5318
Fax: + 32 3 213 5321
info@ecospeed.be

US Office
Phone: + 1 727 443 3900
Fax: + 1 727 443 3990
info@ecospeed.us

www. ECOSPEED® .be

08/14