ECOSPEED®

SHIP HULL PERFORMANCE TECHNOLOGY

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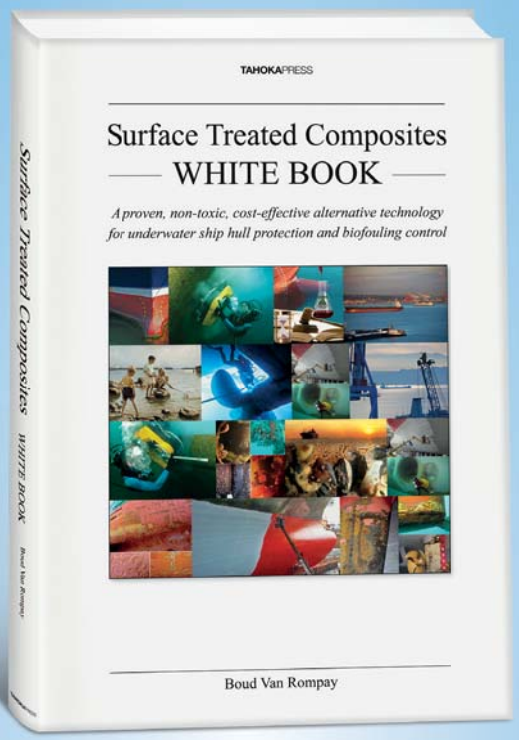

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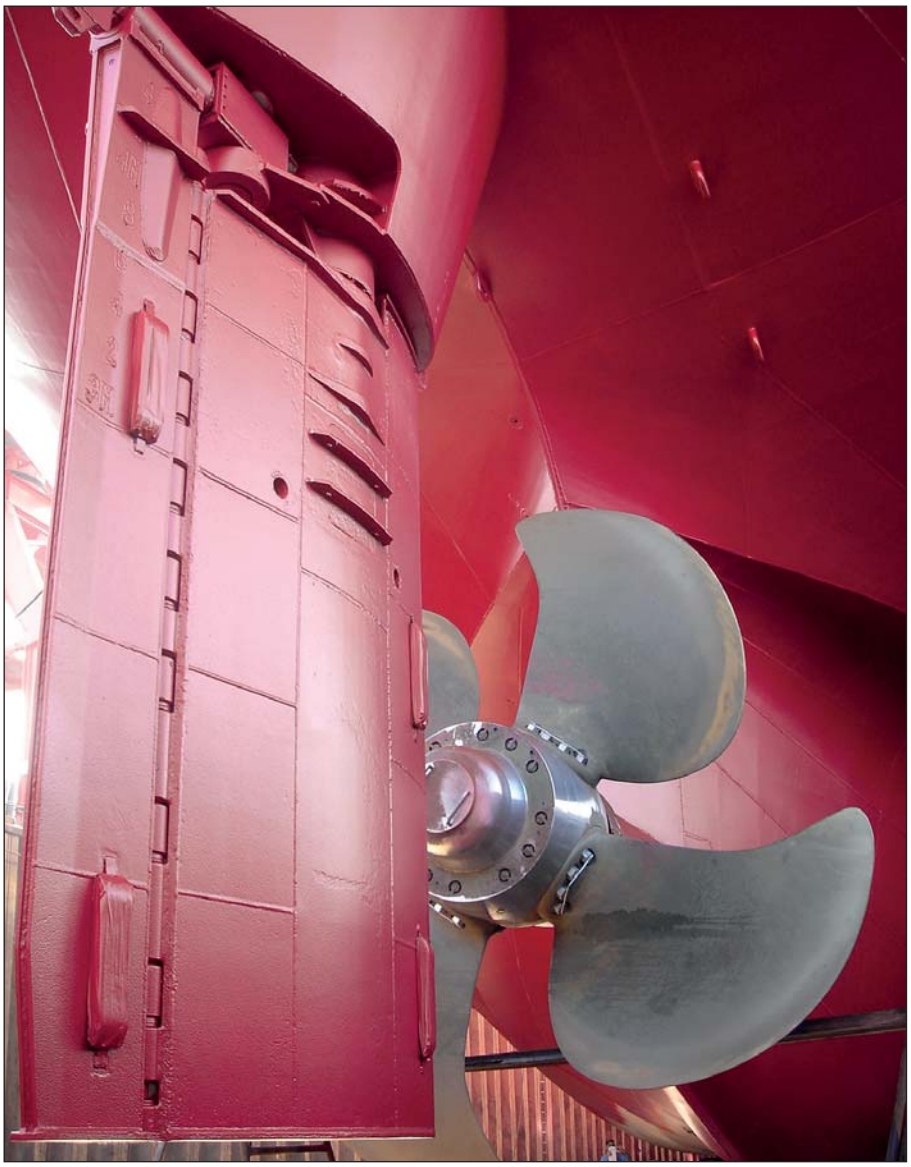
Lasting protection against cavitation and corrosion damage

If a rudder is not given the proper protection against cavitation and the resulting erosion and corrosion damage, the financial consequences can be substantial for the owner.

Cavitation is a fluid dynamics phenomenon where tiny bubbles are created in the water and then collapse forcefully on the metal surfaces of the ship. This is caused by the movement of the propeller blades. The effect is comparable to a steel tipped hammer that is repeatedly hit against a steel surface at exactly the same location; after a while damage will occur. Due to their position just behind the propellers, rudders are particularly prone to cavitation forces and damage. The cavities created by the cavitation will then grow deeper and deeper and in the end can eat right through the rudder (or other affected areas).

Ecospeed's flexibility enables absorption of the forces that are produced by cavitation erosion.

By removing the existing paint layers and applying Ecospeed on rudders we can break the never ending cycle of repairs, painting and repainting



Ecospeed protects areas that are more prone to cavitation damage, like rudders.

Large eroded areas can occur this way. Besides the mechanical damage caused directly by the cavitation process, it immediately opens the door for corrosion damage.

What needs to be done is either prevent the cavitation or make sure that it has no damaging effect. Efforts to prevent cavitation through design changes to ships have had some effect but have not solved the problem. This leaves proper protection as the workable avenue. The Ecospeed glass-reinforced ship hull coating has been found to provide a very thorough and lasting protection against cavitation and corrosion. The coating provides the rudder with an impenetrable protective layer while its flexibility enables absorption of the forces that are produced by cavitation, thereby preventing the damage normally caused by this phenomenon. If the cavitation cannot pierce the coating then no erosion of the steel can occur and no corrosion can follow. The object that is coated with Ecospeed will not suffer from corrosion.

Tests conducted in a flow channel have confirmed that Ecospeed performs extremely well under severe cavitation. These tests were divided into six stages during which the coating was exposed to an increasing pressure drop, creating a growing cavitation force. Even after the last stage no erosion was present on the test patch coated with Ecospeed. The tests were organized by the French Ministry of Defense and were carried out in Grenoble.

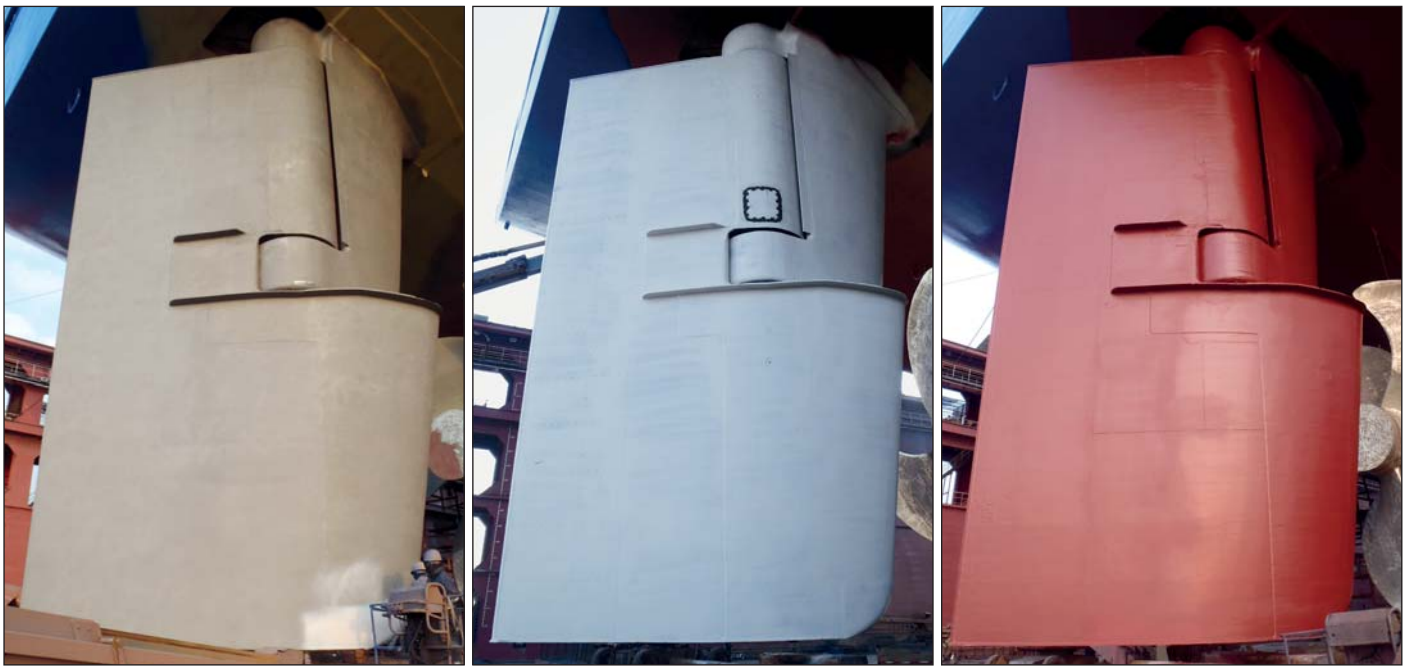
Protection should start at the newbuild phase

When a vessel comes into drydock maintenance of its stern area, especially cavitation damage repair, can take a long time. There are strict procedures concerning blasting, painting, welding and propeller and stern tube seal work. This makes it impossible to carry out most of the repairs that need to be done in these areas simultaneously. Painting is then usually assigned to the end of the schedule. As a consequence it may not get done at all or else prolongs the stay in drydock. Taking into account the tight drydock schedule of most vessels this is often problematic.

With an Ecospeed application one can avoid these problems from day one because no full repaint of the underwater hull will be needed during drydocking, and that includes the rudder. Ecospeed will remain intact for the lifetime of the vessel and is guaranteed for ten years. At the most, touch-ups amounting to less than 1% of the surface area will be required. Planning the maintenance of the vessel's stern area therefore becomes much easier.

The newbuild phase is the perfect time to apply Ecospeed, but the coating can also be used to protect vessels that have been in service for some time and are already facing cavitation and corrosion damage.

Ecospeed's flexibility makes it easy to adapt the application schedule to the rest of the activities scheduled at the shipyard or drydock in a way which does not interfere with them.



After surface preparation, Ecospeed is applied in two identical layers that will last the rest of a vessel's service life.

Overcoating time can be as short as three hours, which means that for smaller surfaces such as rudders or bow thrusters the two coats required can usually be applied in one single day.

Success stories

Ernst Russ successfully ends rudder cavitation damage problems

Founded in 1893 Ernst Russ is a Hamburg based, family owned shipping company. The company has a fleet of ten vessels including five roro cargo ships. Due to the higher propeller revs of these roro cargo vessels, their rudders suffered particularly from cavitation damage.

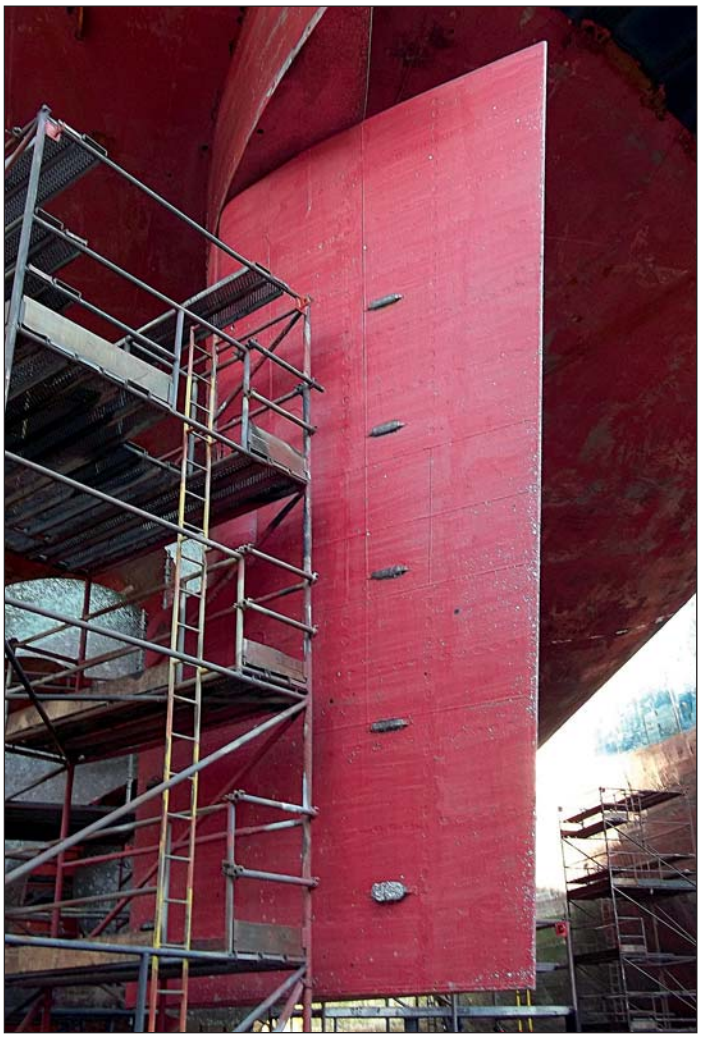
The rudders of the five roro ships were originally coated with a standard epoxy coating. During the first intermediate docking, between two and three years from launch, extensive cavitation damage had already appeared on the rudders.

During a 2004 docking, Ecospeed was applied experimentally on the Elisabeth Russ. The trial was successful beyond all expectations. When the ship next came out of the water in 2007 it could be seen that no further cavitation damage had occurred. As a result, the rudders of the remaining four roro ships were coated with Ecospeed, all with similar results.

The most recent drydocking of the Elisabeth Russ in 2011, confirms that the original Ecospeed protection applied in 2004 is still holding firm and the rudder is intact, free from any further cavitation damage.

"In general everybody is looking to be in drydock as short as possible and to get all the work done as quickly as possible," explains Ernst Russ superintendent Grzegorz Girjat. "Additional hot work on the rudder inevitably results in some collisions with other jobs. I would say for me it is quite clear. Had we not applied Ecospeed on the rudders, we would certainly have extensive work to do in drydock."

Examples of rudders suffering cavitation damage prior to an Ecospeed application.



The rudder of the container vessel Marie Delmas after Ecospeed application in 2007 (left) and during drydocking in 2012 after five years.(right)

Ecospeed in excellent condition on rudders after years at sea

One year after the Ecospeed underwater hull coating had been applied on her rudder, the 197-meter bulk carrier *Gypsum Integrity* came into drydock in Setúbal, Portugal. At the same time Ecospeed was applied on the rudder of her sister vessel, *Gypsum Centennial* at the same location. The excellent condition of Ecospeed on the *Gypsum Integrity* confirmed the owner's decision to have the coating applied on the rudder of their second vessel.

A few months later the 195-meter container vessel *Marie Delmas*, owned by another company, came into drydock in Dubai five years after receiving an identical treatment. The coating on the rudder of the *Marie Delmas* was still in excellent condition. Since then the rudders of several other ships owned by this company, CMA Ships UK Ltd., have also been coated with Ecospeed.

These are just a few of many, many cases where rudder cavitation has been completely dealt with or prevented through the application of Ecospeed.

Conclusion

If one takes into account the costs of the temporary underwater repairs and the regular inspections required by a condition of class until the next drydocking, it becomes clear that the investment in a coating system that offers extra protection from day one is easily won back. For this reason more and more owners have Ecospeed applied on the rudders of a large part of their fleet or have it put in the rudder specs of their newbuild vessels. These owners invest in the right coating system to protect their rudders because they know that the savings will be enormous.

A large number of rudders have now been coated with Ecospeed with 100% success. In all cases where Ecospeed has been standardly applied, the rudders suffered no cavitation damage and did not need to be recoated. ■

KEEPING SHIPS IN BUSINESS



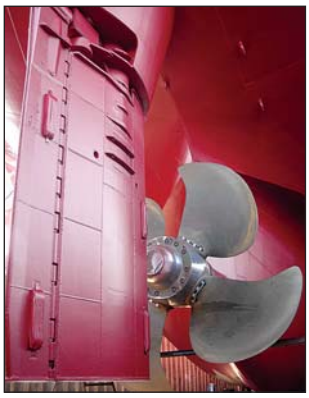










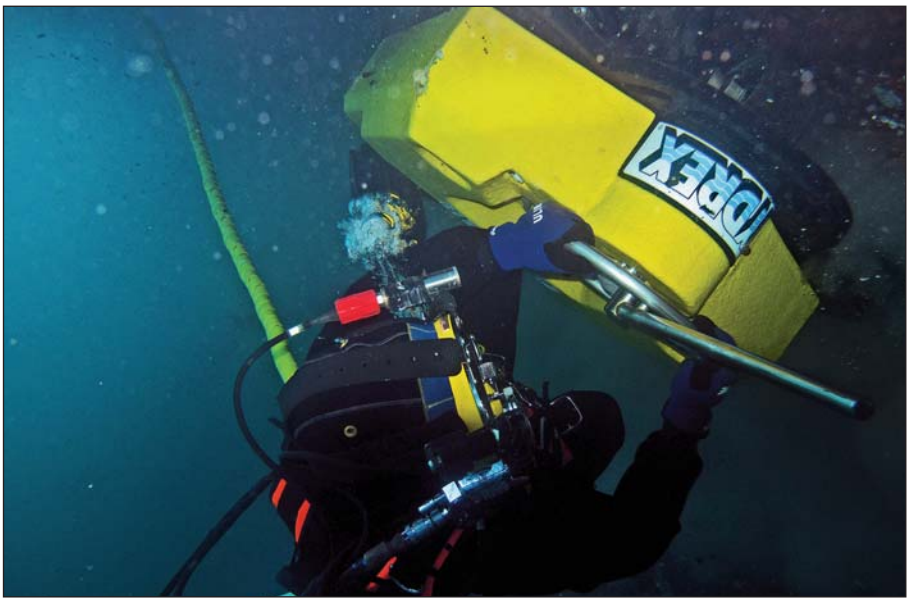






Ecospeed allows cost-effective, non-toxic fouling control on underwater ship hulls

There is currently no hull coating available – biocidal, non-stick or hard – which will not foul. Any level of fouling, including biofilm or slime, carries with it a considerable fuel penalty. With current fuel prices, this penalty is too expensive to ignore. The only way to remove this fouling is to clean it off. Like it or not, ship hull cleaning is an essential part of operating a vessel or a fleet efficiently and economically.



Ecospeed underwater maintenance is carried out with specially designed tools.

If a ship is to sail clean then the cleaning must be 100%. It takes longer and therefore costs more. However, this extra time and money is more than recovered since the ship operates with a clean hull, thus benefiting from the maximum fuel savings. It is also the way to prevent the spread of non-indigenous species (NIS) and thus avoid falling "foul" of the increasingly tight regulations on this subject. Finally, along with regular cleaning goes regular inspection of sea chests and other nooks and crannies so that the ship can be kept in top running condition and any problems can be predicted and avoided.

In most circumstances, the best and most viable approach is to clean the ship 100% and to do so regularly and always before sailing if the ship has been stationary for a long enough period to have become fouled.

And ship hulls must be protected with a system which lends itself to fast, effective underwater cleaning without risk of damage to the coating and without posing any kind of hazard to the environment.

New versions of the underwater hull cleaning equipment are regularly put into practice to achieve an even faster cleaning rate without losing any of the quality.

The benefits of underwater cleaning on Ecospeed

1. Ecospeed improves with each underwater treatment

One of the many unique factors of this underwater hull coating system is that with repeated underwater hull cleaning, the coating's surface aspect does not degrade but gradually improves. This procedure is made easy by the coating's technical properties. Cleaning can be carried out whenever needed, at any point in its lifespan, without causing damage.

Regular underwater cleaning of the coating results in improved hull smoothness each and every time the hull is cleaned. Tests have shown that a very large number (+500) of repeated underwater hull cleanings improves its surface texture without any adverse effects.

2. Long lay-up periods have no effect on the condition of the Ecospeed coating

Ecospeed is ideally suited for ships which have a stationary period because an impermeable and impenetrable barrier is created during application. This gives the coating its excellent and durable anti-corrosive properties and protects the underwater hull against mechanical damage. Despite the aggressive nature of certain types of fouling, no rust or damage to the steel will be present on the underwater hull of the vessel after cleaning. The hard fouling is unable to penetrate or damage the glassflake coating.

3. TBT-free, copper-free, biocide-free and silicone oil free solution

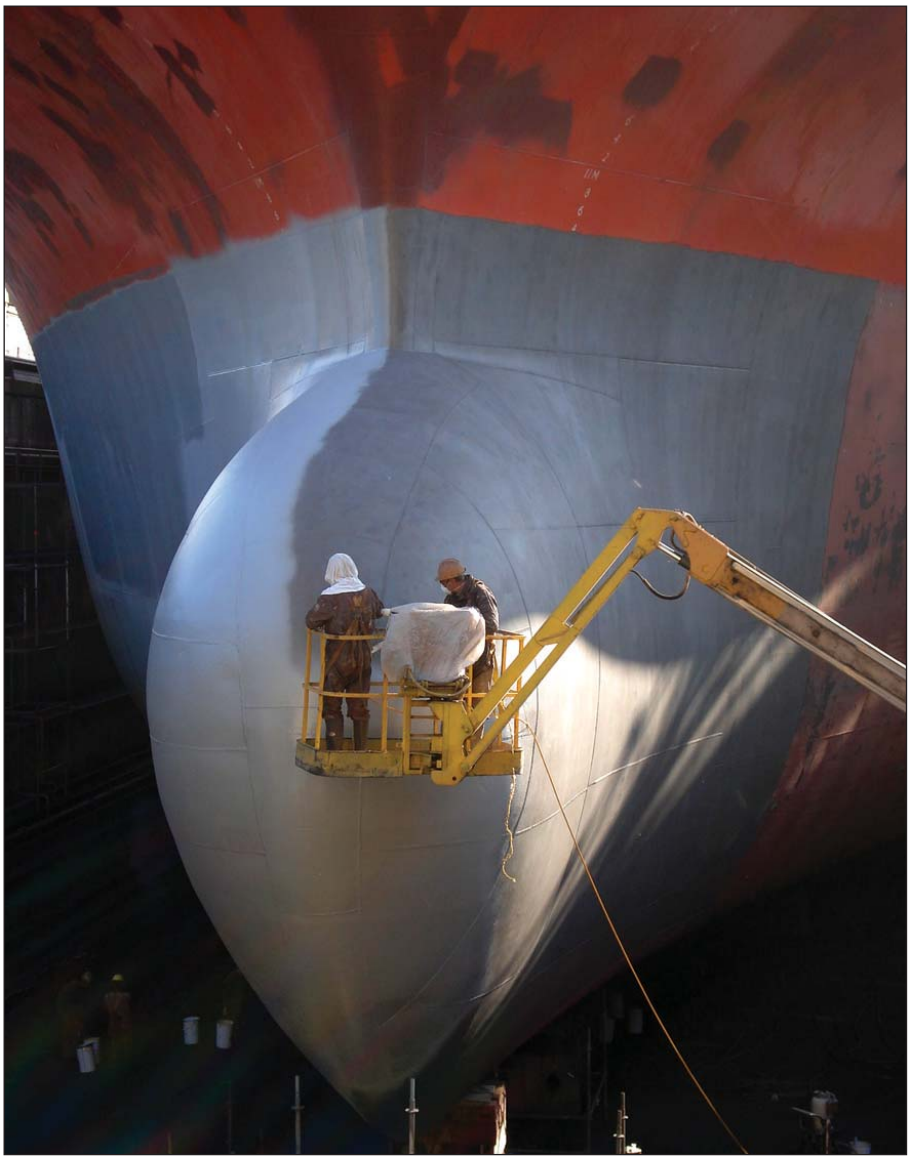
In 2008, stringent tests were carried out within the framework of an EU LIFE demonstration project to provide scientific data and to authenticate the non-toxicity of the Ecospeed hull performance technology. This research proved that the coating is 100% non-toxic and that there is no negative effect on the water quality or the marine environment at any point of its application or use.

4. The solution to the NIS problem

The underwater cleaning of Ecospeed can be regarded as a safe measure that prevents, rather than remedies, the spread of NIS. Firstly, Ecospeed can be cleaned on a regular basis without damaging the coating's surface. The cleaning interval is optimized to minimize fouling and the associated increase in fuel consumption. In other words, regular cleaning prevents macrofouling from building up and at the same time presents an opportunity to inspect so-called niche areas. Secondly, Ecospeed is a very durable coating that withstands abrasive cleaning for which very effective specialized tools have been developed. As a result, many of the fouling organisms will be destroyed during cleaning. As long as only microfouling or locally acquired macrofouling is cleaned off the hull and niche areas, the risk of translocation of NIS via hull fouling is minimal. Standard use of Ecospeed is the key to resolving the hull-borne NIS issue.

Fouling can be removed in drydock with high pressure tools or underwater while improving the coating.

Independent tests were carried out in 2008, proving that Ecospeed is 100% toxin-free.



An Ecospeed application is adapted to the shipyard's schedule and not the other way around.

5. Underwater cleanings on Ecospeed allowed

After the submission of the experimental results of aforementioned EU-LIFE demonstration project to port authorities and environmental agencies worldwide, several major ports have already overturned the existing general ban on underwater hull cleaning, specifically making an exception for vessels coated with Ecospeed.

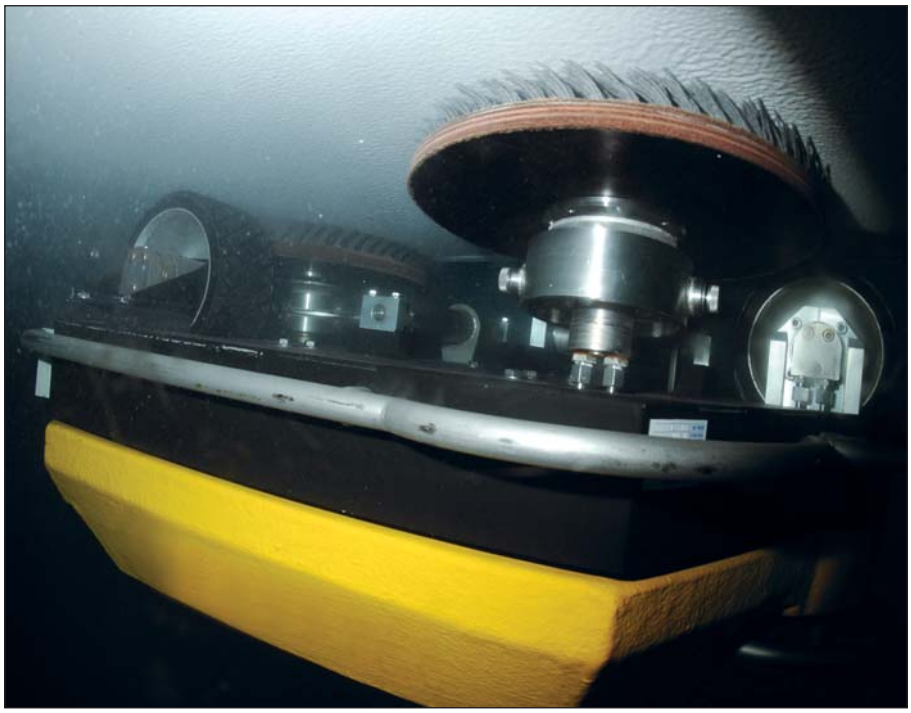
6. Specially designed equipment used by trained divers

Underwater maintenance of Ecospeed is carried out with specially designed underwater hull cleaning tools that simultaneously remove all fouling and optimize the smoothness of the paint surface. A complete line of equipment was designed in-house to allow divers to clean the flat areas as well as the harder to reach parts of the hull without damaging the coating.

Hydrex diver/technicians are specially trained to work with the latest versions of the underwater hull cleaning tools. This allows them to carry out underwater maintenance of the Ecospeed underwater hull coating in the shortest possible time frame.

7. Fewer and shorter drydockings

Over the last couple of years there has been a trend of extending the maximum drydock interval from five to seven and a half years or even ten years. Several large classification societies already allow this extension, but only if a stringent set of rules is followed. One of the requirements is the execution of a very strict preventative or semi-preventative underwater maintenance



Regular underwater treatment of Ecospeed is at the moment a Best Available Technology to minimize the risk of transferring non-indigenous marine species.

Hydrex diver/technicians are trained to work with the latest versions of the underwater hull cleaning tools.

The non-toxic and durable Ecospeed coating has won several awards.

plan. Ecospeed's qualities make the coating ideally suited for such a regime. Regular underwater cleaning, removing any marine fouling at a very early stage, will maintain and improve the ideal surface characteristics. Some offshore vessels are expected to stay out of drydock for 20 years and a hard, inert long-lasting coating such as Ecospeed is the only way to make this possible. The biggest barriers to ships staying out of drydock for 7.5 or more years are dealing with biofouling and maintaining hull coating integrity. Ecospeed allows ship owners/operators to overcome both these barriers.

Summary

Ecospeed can be cleaned underwater without risk of chemical pollution to the environment or of damage to the coating. The coating can be cleaned aggressively and rapidly and will only improve in smoothness with each cleaning. Underwater maintenance of Ecospeed can be regarded as a safety measure that prevents the spread of NIS. For these reasons several economically important ports have already overturned the existing general ban on underwater hull cleaning, specifically making an exception for vessels coated with Ecospeed.

Ecospeed's qualities also make the coating ideally suited for the very strict preventative underwater maintenance plan that is part of the requirements to extend a vessel's drydock interval to 7.5 years.

Underwater maintenance of Ecospeed is carried out with in-house designed underwater hull cleaning equipment by specially trained Hydrex diver/technicians. This allows them to clean the flat areas as well as the harder to reach parts of the hull without damaging the coating. ■

ECOSPEED®

SHIP HULL PERFORMANCE TECHNOLOGY

Ecospeed gives a very thorough and lasting defense against cavitation and corrosion damage for a ship hull's entire service life.

The coating equally provides the underwater hull with an impenetrable protective layer while its flexibility enables absorption of the forces that are produced by cavitation. This prevents the damage normally caused by this phenomenon.

By removing the existing paint layers and applying Ecospeed on the hull we can break the never ending cycle of painting, suffering damage, having to perform extensive repairs in drydock followed by a full repainting, again and again.

With an Ecospeed application no full repaint will be needed during drydocking. Ecospeed is guaranteed for ten years. At the most, minor touch-ups will be required.

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

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