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UNDERWATER TECHNOLOGY

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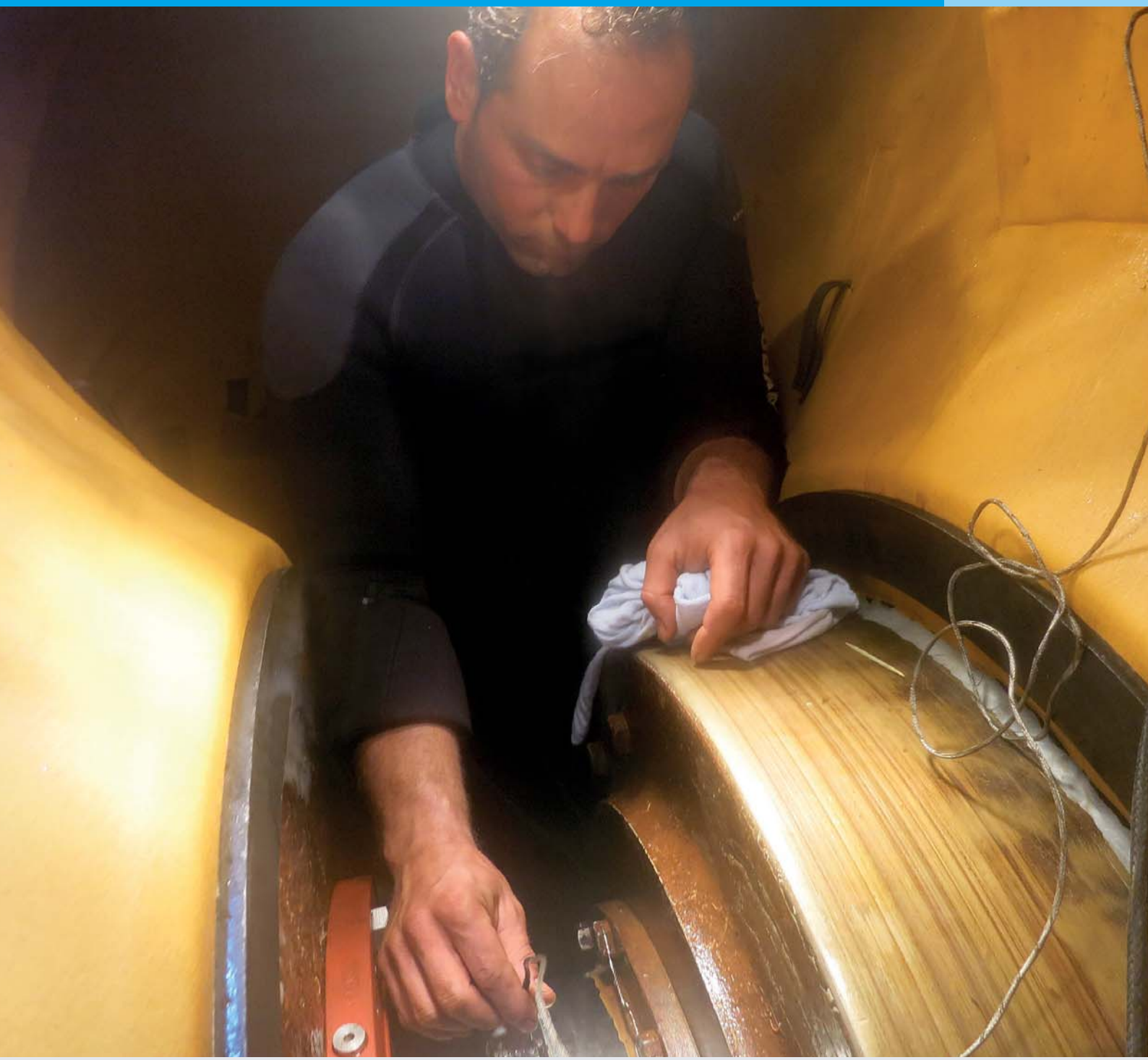

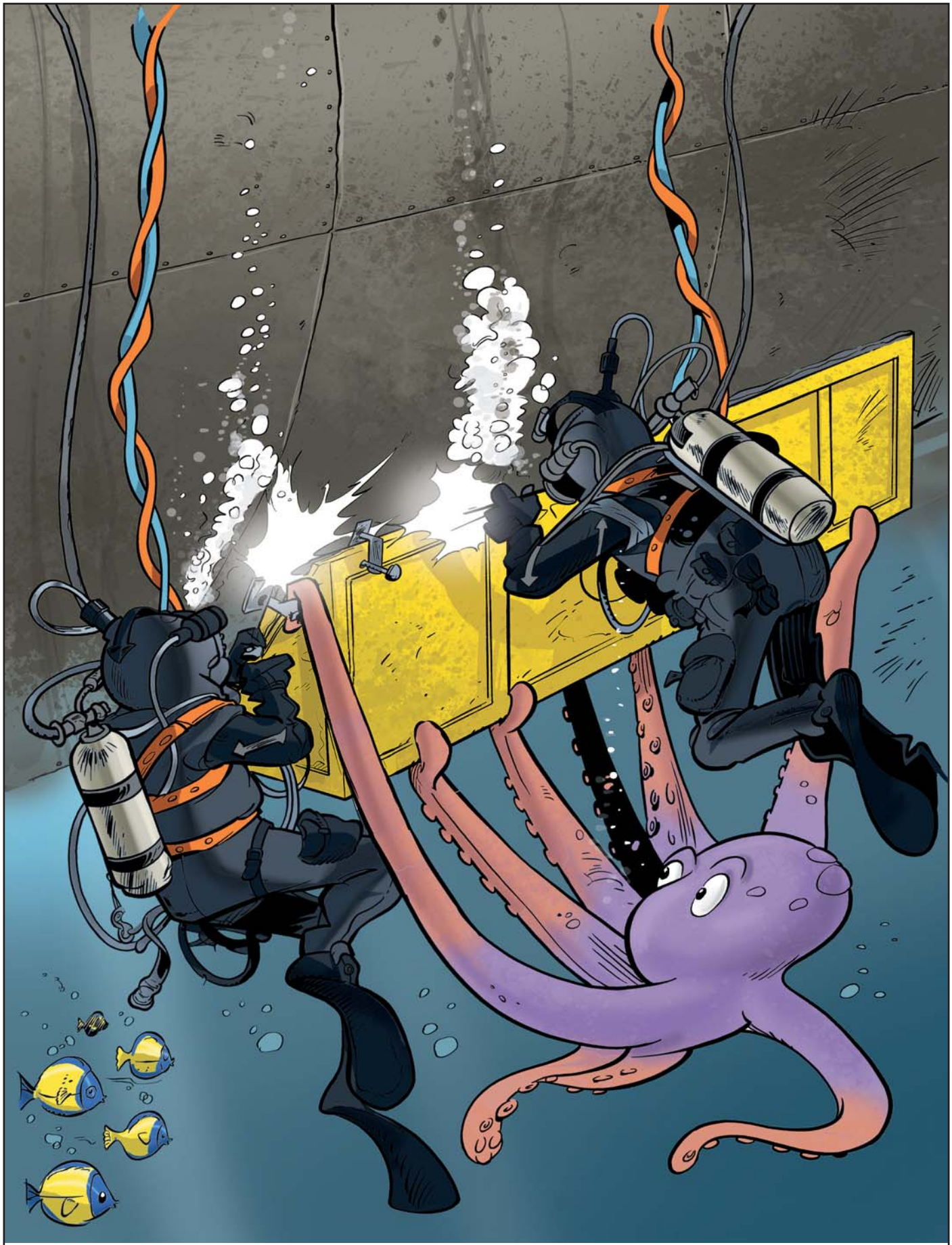

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www.hydrex.be

Editorial

I am very happy to announce that we have won the 2014 Seatrade award in the category *Innovation in Ship Operations* for Ecoshield, the durable, cavitation-damage-proof rudder protection. Ecoshield was launched in 2013 by Subsea Industries, one of the Hydrex companies, after more than 10 years of strenuous testing. More information on Ecoshield and the award can be found in the latest issue of our Ecospeed newsletter or on our website (www.hydrex.be).

In this magazine we offer you some case studies of a few of the operations carried out by Hydrex diver/technician teams on vessels around the world.

The first article describes a stern tube seal replacement on a 157-meter dredger in Montevideo. The vessel was suffering from an oil leak, and an on-site solution was needed. One of our teams carried out the repair underwater using our flexible mobdock, thus avoiding the need for a costly trip to drydock for the owner.

Further on you can read about two propeller blade modifications carried out on bulk carriers by Hydrex divers. In Algeciras the four blades of a 170-meter vessel's propeller were cropped, while in Dunkirk a similar operation was carried out on a 229-meter ship. Both bulk carriers were able to continue their scheduled operations with the performance of their propellers fully restored.

The magazine ends with an article on how Hydrex can save you up to 40% on your fuel bill. Feel free to contact us if you want to know more on how you can obtain it for your vessels.

Best regards,

Hydrex founder
Boud Van Rompay

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Underwater stern tube seal repair in Uruguay under challenging circumstances

In April a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 157-meter dredger in Montevideo, Uruguay. The ship was suffering from an oil leak, making an on-site repair necessary. Using a Hydrex flexible mobdock the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

The heavily corroded rope guard needed to be replaced.

Hydrex has carried out on-site, underwater repairs and replacements on all types of seals for a number of years now. A dry environment is created underwater in which the divers can work. Several major classification societies have also awarded Hydrex certificates that accept the Hydrex revolutionary flexible mobdock technique to perform permanent underwater seal repairs which previously would have had to be done in drydock.

Every Hydrex office has a fast response center equipped with all the latest facilities, equipment and tools. These centers were designed specifically to increase speed of service. The lightweight flexible mobdocks packed in flight containers allow for a very fast mobilization and a timely arrival of Hydrex teams on any location around the world with everything they need to successfully complete the job.

The following case study gives an account of a recent underwater stern tube seal repairs performed by Hydrex.

A fishing line tangled around the assembly could have caused the leak.

The entire housing was replaced because the old one had suffered cavitation damage.

The split ring was removed, cleaned and reinstalled afterwards.

Leaking stern tube repaired on-site

Oil was leaking from the stern tube seal assembly of a 157-meter dredger. A team of Hydrex diver/technicians therefore mobilized to the vessel's location in Uruguay, together with all the needed equipment.

After the diving team had set up a monitoring station they removed the rope guard and performed a thorough underwater inspection of the stern tube seal assembly. This revealed that the entire housing of the assembly was severely corroded and needed to be replaced. Because the housing consisted of split shells, this could easily be done by the Hydrex team.

Next they installed the flexible mobdock. By doing this, the divers created a dry working environment around the stern tube assembly. This is needed for any permanent stern tube seals repair. The team then removed the three damaged seals one by one and replaced them with new ones.

Because the existing running area was worn out, the diver/technicians installed a spacer ring to create a new running area for the seals. Thanks to a newly developed method, this could also be done inside the flexible mobdock, saving precious time and avoiding water ingress during the installation of the spacer ring .

Leakage tests were then carried out with positive results, after which the divers removed the flexible mobdock. The operation ended with the installation of a new rope guard. This was necessary because the old rope guard had suffered severe cavitation damage and could not be used again.

New generation cold straightening equipment

In its quest to provide cost effective services to customers, Hydrex developed procedures to address different kinds of damage to propellers. This research led to the design of the Hydrex cold straightening machines first used in 2002.

By taking advantage of this technique damaged blades can be straightened underwater, allowing the ship to return to commercial operations without the need to drydock. Blades can be brought back close to their original form, restoring the propeller's optimum efficiency.

The cold straightening machines have been in use for quite some time now but the Hydrex research department has been looking into ways to expand the technique even further to improve our services. A new version of the straightening machine was recently put into practice. It is compatible with the existing models and is used to restore more severely bent propeller blades to their original condition.

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The old running area of the seals was worn down.

Hydrex diver working on the assembly inside the flexible mobdock.

Summary

The stern tube seal repair was carried out in less than optimum conditions. There was almost no inwater visibility at Montevideo at the time of the repair. It made the diving operations a lot more challenging than expected. However, our divers are trained to be flexible and adapt to constantly changing working conditions making it possible for Hydrex to perform the stern tube seal repairs under the strictest safety regulations, to the highest quality standards and without any unnecessary delay. The dredger was able to leave Montevideo in time to sail to its next operation. ■

Fast propeller repairs in Spain and France prevent costly drydocking

Recently teams of Hydrex diver/technicians performed propeller blade croppings on bulk-carriers in Spain and France. In Algeciras the four propeller blades of a 170-meter vessel were cropped. A similar operation was carried out on a 229-meter ship during her stay in Dunkirk.

All four blades of the bulker needed to be cropped.

Having developed different procedures for different kinds of damage, Hydrex is equipped and trained to make the best out of a bent or broken propeller. Ideally, the in-house developed cold straightening technique is used. This procedure enables Hydrex to straighten damaged blades in-water, allowing commercial operations to continue without the need to drydock.

In the following examples cropping was the only option as the damage to the propeller blades was too great to allow cold straightening. This kind of repair is carried out with the propeller blade cutting equipment developed by the Hydrex research department. In cases where there is an even number of blades an identical piece will be cropped from the opposite blade to restore the hydrodynamic stability of the propeller. By doing so, the best possible efficiency is obtained.

One of the bent blades of the bulker in Dunkirk.

Underwater blade cropping in Dunkirk

The four blades of a 229-meter bulk-carrier's propeller were severely bent. An on-site solution was needed to restore the propeller's balance and efficiency. A team was therefore mobilized to the ship's location to restore the damaged blades to as close to their original condition as possible.

After the equipment arrived at the vessel's location the team started the operation with a detailed survey of the affected propeller blades. The inspection revealed that the four blades were bent over angles of up to 90 degrees. The team then used the information acquired during the inspection to calculate and determine the correct measurements needed to modify the trailing edges of the propeller blades. Next the divers cropped the blades and

Swift on-site bow thruster operations

The Hydrex lightweight flexible mobdocks are designed to be easily transported around the world and are used to close off the thruster tunnel on both sides, allowing divers to perform repairs and other operations in a dry environment around the bow thruster unit.

This technique enables them to reinstall the propeller blades of an overhauled thruster inside the thruster tunnel after the unit has been secured or replace the blades or seals and perform re-pair work on a specific part with-out removing the unit.

Since the development of this flexible mobdock technique, numerous thruster repairs have been carried out by Hydrex diver/technicians around the world.

There is no need to send the vessel to drydock as all operations can be carried out in port or while the vessel is stationary at sea. Normal commercial activities can therefore continue without disruption.

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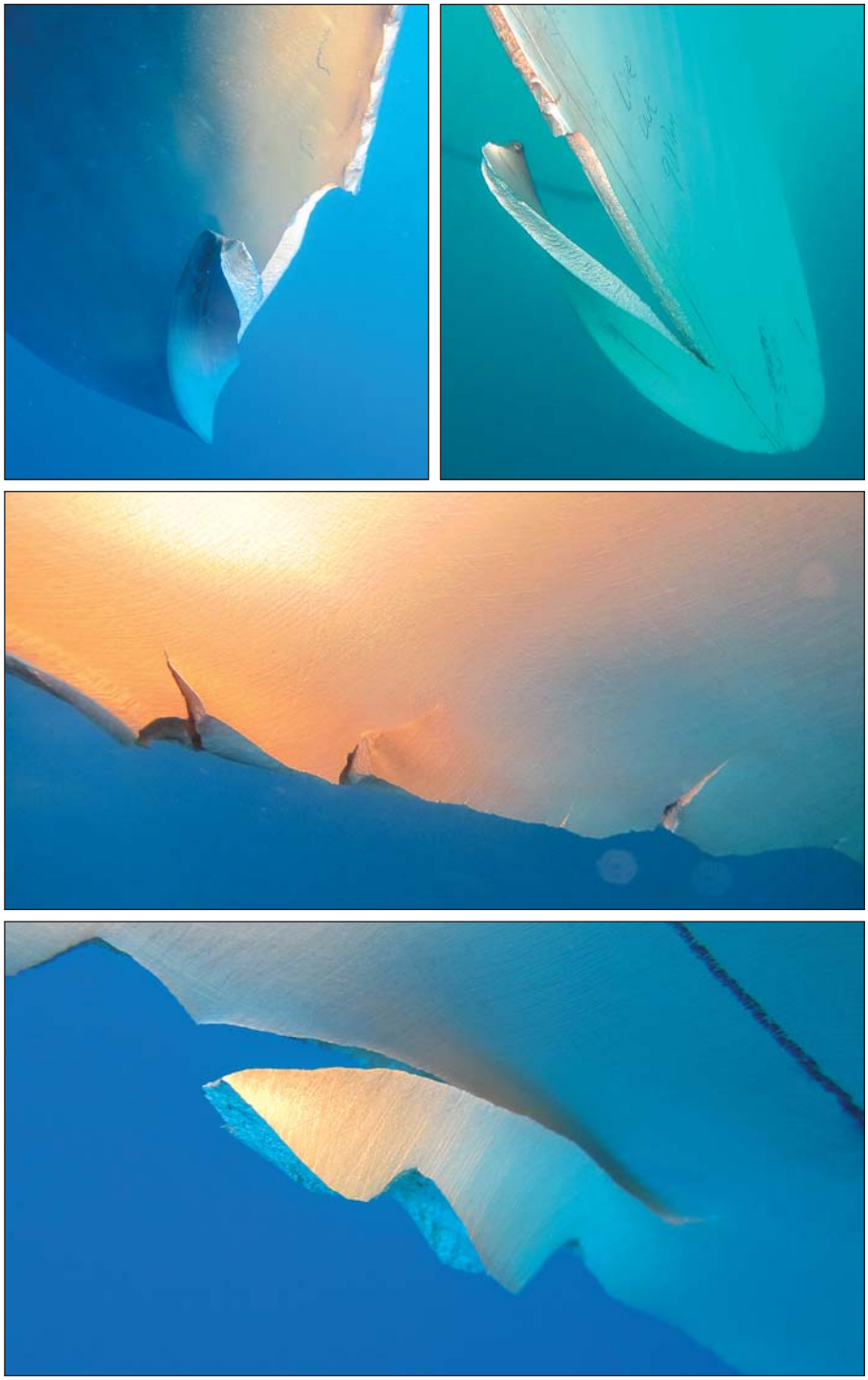
ground their edges to give them the correct radius. When the cropping was complete, the Hydrex technicians polished the blades to make sure that any remaining loss of efficiency would be minimal.

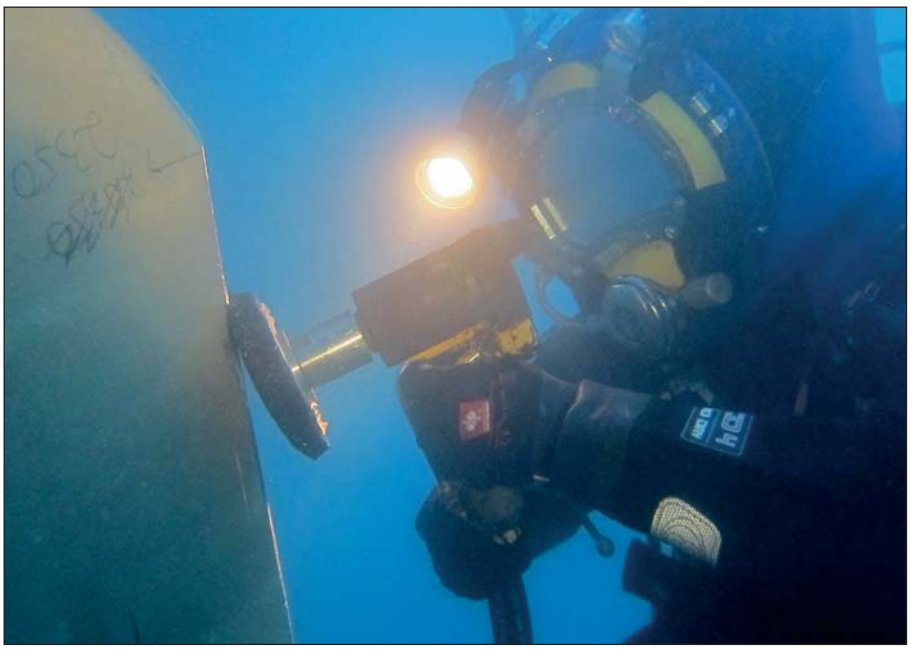
Fast propeller operation in Algeciras

The damage to the blades of the 170-meter ship was less severe. It consisted of cracks, cuts and missing chips on the leading edges of the four blades. Despite the relative size of the affected areas, the uneven surface caused a drop in the performance of the propeller. Cropping all four blades was the only way the bring them back as close to their original condition as possible and optimize the performance of the propeller.



Damaged leading edges of the four blades of the vessel in Algeciras.

Hydrex technician cropping one of the blades in France.



Hydrex diver grinding the edge of one of the cropped blades.

Polishing the cropped blades prevents performance loss.

Cropping on of the four blades of the bulker in Spain.

The repair was carried out by a Hydrex diver/technician team mobilized from the close-by office in Algeciras following the same procedure as the operation in Dunkirk.

Conclusion

Both bulkcarriers could continue their schedule without going off-hire to drydock and with the performance of their propellers restored.

Our R&D department is constantly looking into ways to enhance the available propeller repair techniques even further to improve our services. New types of both the straightening and cutting machines have recently been put into service. These allow us to straighten blades that could previously only be cropped and to crop extremely damaged blades with only a minimal loss of efficiency for the propeller. Both types of repairs can be carried out fast, fluently and efficiently on-site and underwater, allowing the ship to return to commercial operations without the need to drydock. ■

Hydrex: Helping shipping save fuel, cut costs

Hydrex takes care of the outside of your ship from the water line down. The potential for saving money by proper protection, care and maintenance of the underwater hull is enormous. In this article we look at how Hydrex's underwater technology expertise can help you realize that potential.

The need to cut costs and save money in all sectors of shipping is evident. The industry has not fully recovered from the global recession which began in the third quarter of 2008. Fuel prices are high. Added to this, measures to reduce the emission of harmful atmospheric gases by shipping include the use of higher priced fuel. These two factors have ship owners and operators, shipping companies and the whole industry tightening its belt and looking for ways to reduce costs and maintain profit margins.

Installation of a PBCF can bring you up to 5% fuel savings.

Ultra Low Friction

Steps to improve fuel efficiency and thus reduce a ship or fleet's fuel bill rank high in priority. Why? Because fuel is such a major expenditure in most shipping operations.

Below the water line, the main factors which affect fuel efficiency are the friction of the hull and the state of the propeller.

By using a long-lasting, hard hull coating and keeping it clean of fouling, by buffing the propeller regularly and keeping it ultra smooth and clean, by adding propeller boss cap fins (PBCFs) for greater propeller efficiency, much can be done to reduce fuel costs. These three factors could make a 10 - 40% difference in fuel costs, depending on a ship's current practices.

Hull cleaning is key to fuel savings. A hull kept clean of even medium fouling is very fuel efficient. How-

Propeller buffing is a far better alternative method of keeping a propeller in top notch condition.

ever, cleaning should only be done on non-toxic hulls and should not in any way damage the coating or harm the environment. The best answer is a hard, cleanable coating combined with frequent cleanings so that the hull never has more than a light slime on it. In terms of cost, this is by far the most efficient approach. A high quality hard coating that does not deteriorate over time but only becomes smoother, such as Ecospeed, is the answer to ultra low friction over the life of the vessel.

These factors have been covered in detail in the previous issue of the Ecospeed magazine and there is no need to repeat them exhaustively here. They come under the category of achieving the least friction possible in propeller and hull. We categorize these measures under the heading of ultra low friction. Feel free to contact us if you want more information on this subject.

But there are other ways to cut costs and save money and Hydrex has the answer to those that have to do with the underwater hull and running gear.

Underwater inspection, maintenance and repair

Underwater hull inspections

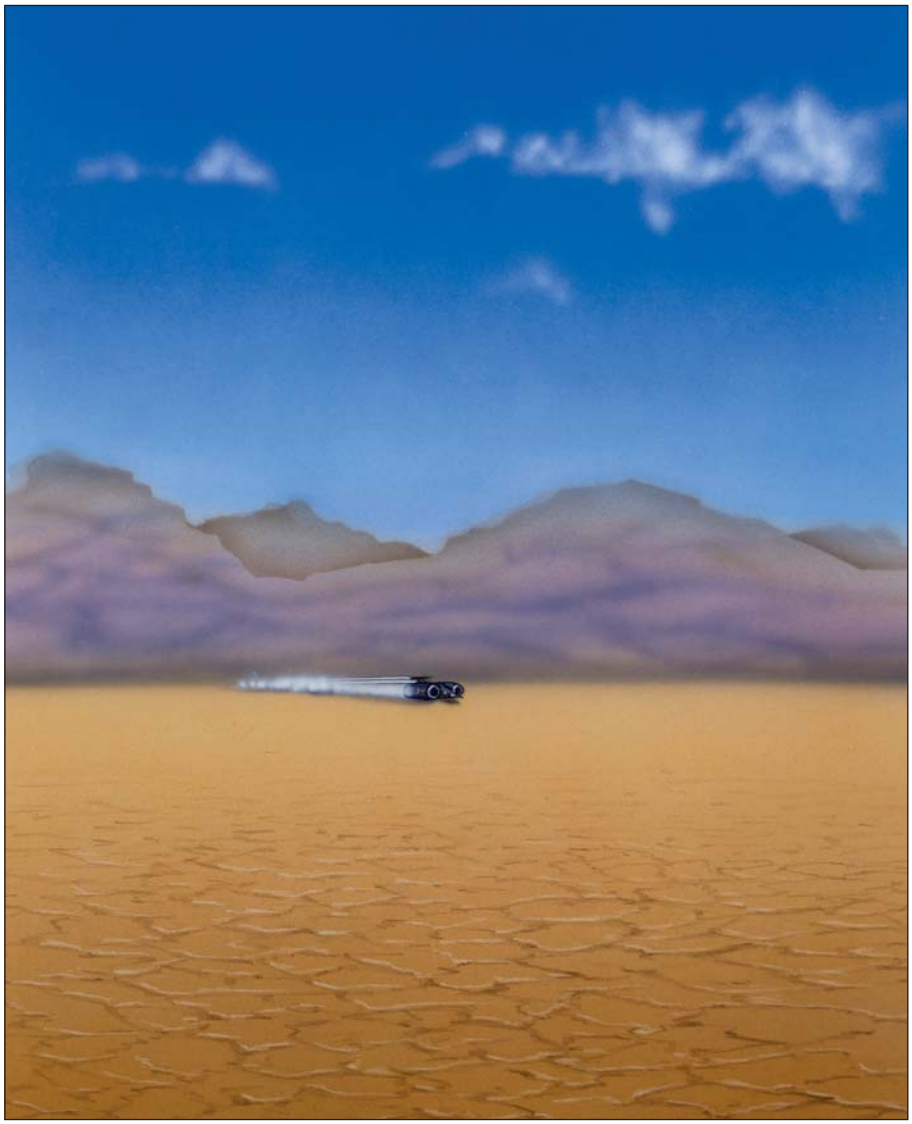
Underwater inspections represent a small investment and, if properly done, have the potential to save an owner/operator a great deal of money.

How?

Competent underwater inspections, particularly if carried out regularly can detect

1. Problems with the propeller such as bent or damaged blades (which can put undue strain on bearings), roughness due to fouling, cavitation damage or bad polishing which can reduce the propeller's efficiency
2. Anodes which have worn away, rendering the cathodic protection system unworkable,

Hydrex technician following an underwater inspection inside the onshore monitoring station.



Hydrex diver/technician getting ready for an underwater operation.

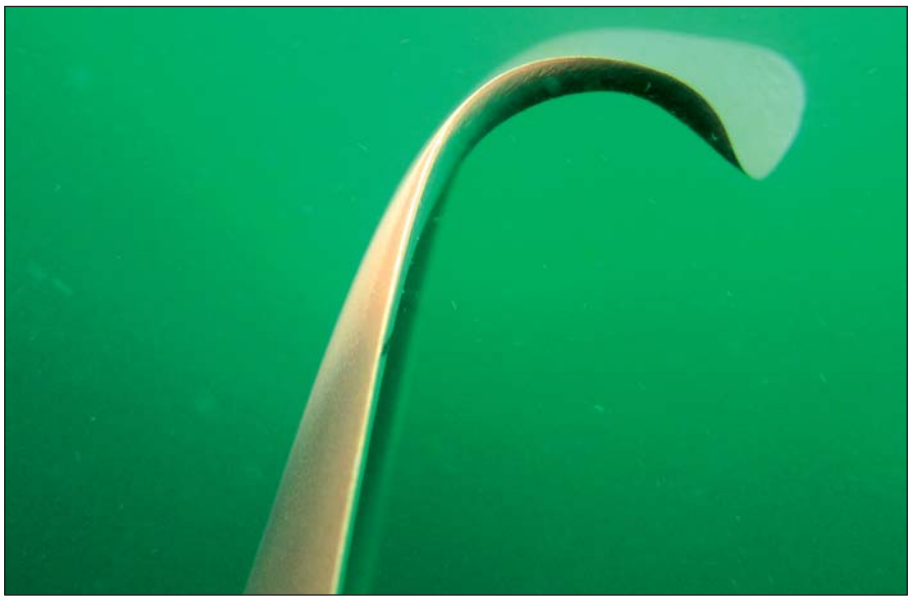
Regular inspections carried out by competent divers and followed by comprehensive and accurate reports can detect any of these or other problems. These can then be corrected early, thus avoiding the more costly repair which neglecting them could lead to.

Inspections before drydocking

There is another important way for underwater inspections to be used to save costs. A thorough inspection carried out a week or two before a

leading to corrosion and added hull friction

3. Hull cracks or other damage which, if not rapidly arrested, can worsen and increase the cost of any subsequent repair
4. Ropes inside the stern tube assembly which may cause seal problems if neglected
5. Leaking stern tube or thruster seals which can cause an environmental problem in port and lead to costly changes to a ship's schedule if not caught quickly and repaired
6. Clogged sea chest grids (preventing proper cooling of the ship's engines), or loose or damaged grids
7. Loose or broken grids on thruster tunnels which can result in damage to thruster propellers
8. Damaged, bent, broken or detached bilge keels which again can become much worse if not caught early
9. A damaged rudder which will continue to deteriorate if not addressed rapidly, resulting in the need for much more costly repairs and representing a safety hazard in extreme cases.


Severely bent propeller blades can be modified to restore the propeller's performance.


Bow thruster blades can be replaced on-site.

ship is due to go to drydock can save a great deal of money in drydock. An accurate estimate of work required can lead to efficient scheduling. If thrusters are to be repaired in drydock they can be removed prior to the ship's drydocking and can be repaired and ready for reinstallation when the ship is in drydock, rather than waiting until the docking to find out and then having to extend time in drydock in order to repair and replace the thruster.

An accurate report on the state of the rudder can lead to effective repair and recoating of the rudder so that it does not suffer further damage.

The all-too-frequent scenario of a low estimate for drydocking which grows exponentially once the drydock gate has closed and the ship is out of the water can thus be avoided.

Maintenance and Repair

Propellers: Bent or damaged propeller blades can be very successfully repaired in the wet, either by cold straightening or, where the bend is too bad, by cropping. This can all be done with the vessel afloat and with minimal interruption to its schedule. It can prevent strain on bearings and in the long run result in considerable savings.

Propeller buffing has recently been introduced by Hydrex as a far better alternative method of keeping a propeller in top notch condition hydrodynamically than the polishing methods in general use. Buffing is a much lighter process and is much kinder to both propeller and environment since it does not remove material from the propeller itself. It results in a shiny and smooth propeller which can contribute greatly to fuel savings.

Hull repairs: Caught early, a crack or other damage in the hull can be minimized and prevented from worsening. Left unattended, such damage can spread and lead to the need of far more costly repairs.

A damaged bilge keel can be repaired.

Thrusters: Thrusters blades can be removed for repair and replaced. A thruster unit can be overhauled and smaller repairs can be carried out without removal of the thruster.

Seals: Leaking seals can be repaired before they become so bad that the ship is not even allowed in port. Damage to the seal assembly can be repaired. Rope guards can be replaced if needed.

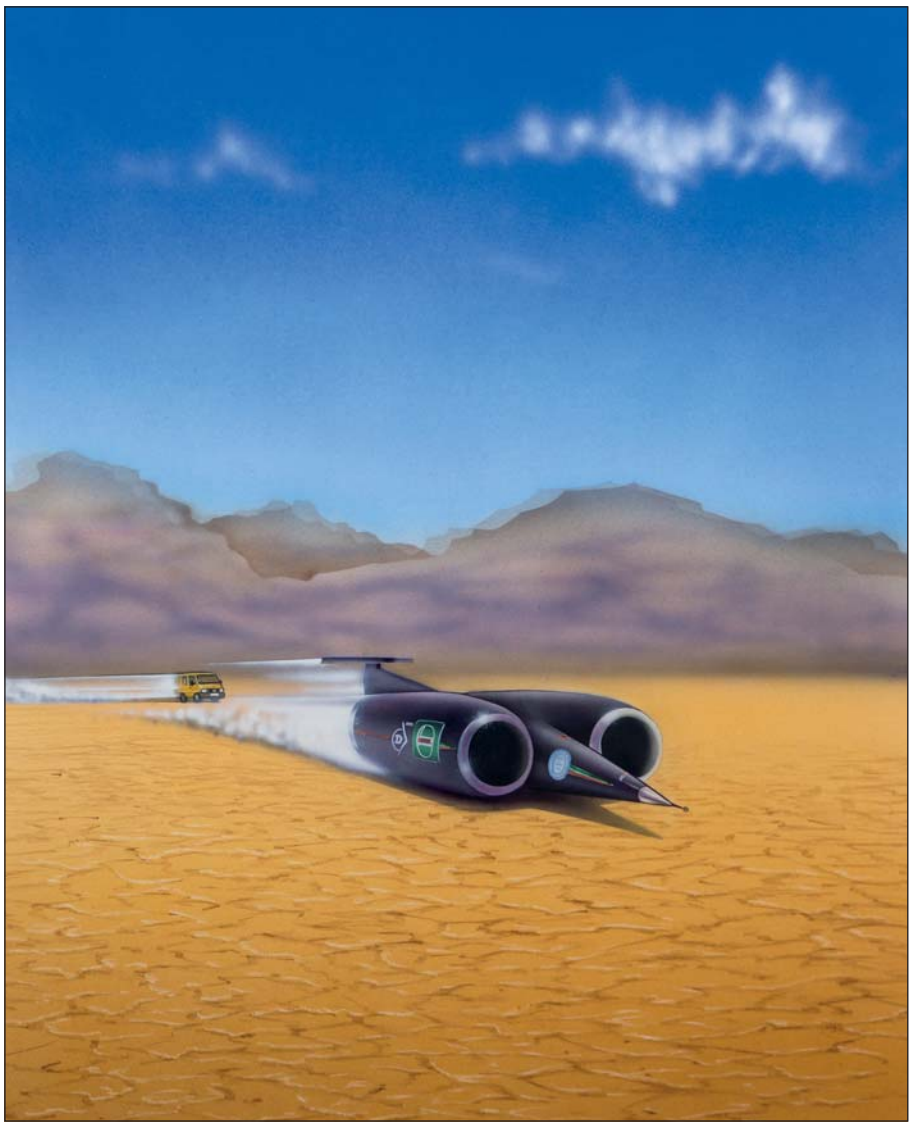
Rudder: Any needed repair to the rudder can be done underwater.

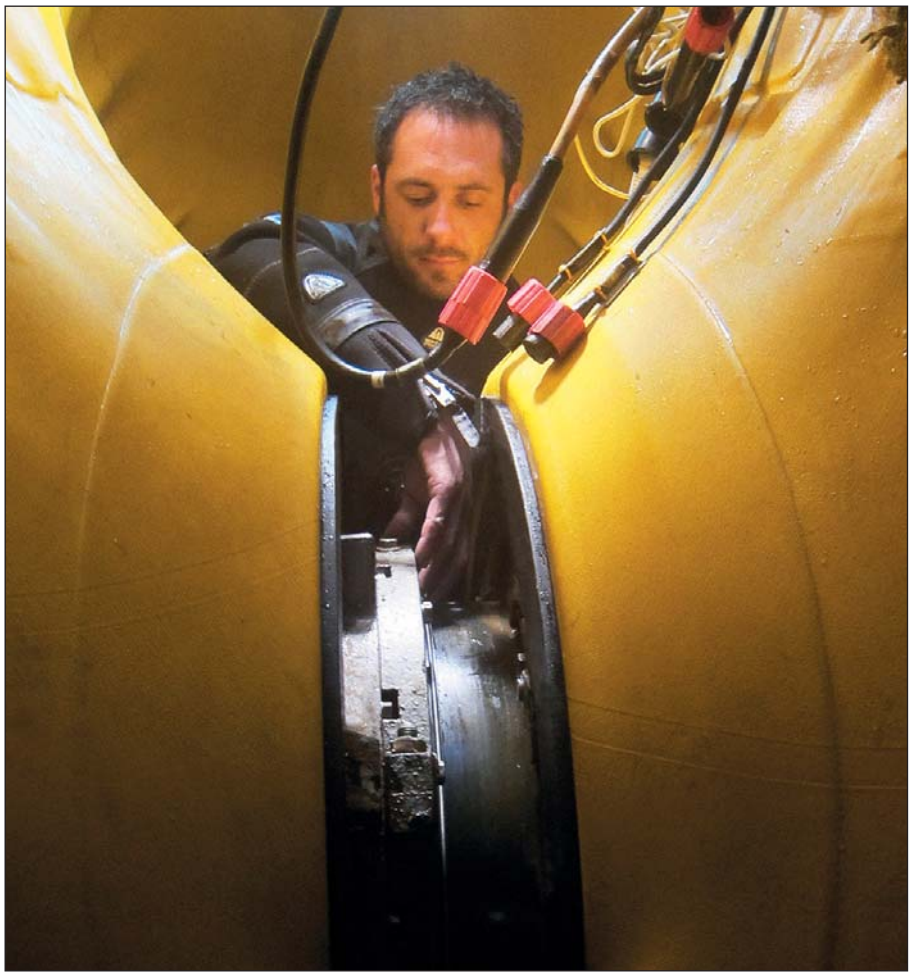
Anodes: When anodes are worn down and ineffective, corrosion of the hull can increase considerably. It is far less expensive to replace a worn anode than to replace corroded steel plates worn too thin to be safe.

A more detailed description of all the underwater repair services Hydrex offers can be found on our website. Feel free to contact us at hydrex@hydrex.be, our technical department is ready to answer your questions and find a solution for your specific needs.

Recommendations

We recommend that any ship uses





Hydrex diver during an underwater stern tube seal repair.

propeller buffing four times per year to keep the propeller at its most efficient. The fuel savings from this action alone are considerable and more than cover the cost of the buffing. At the same time for little additional cost, the hull can have a proper inspection which will reveal the state of fouling and also find any other problems which can be caught early and rectified before they become more serious and expensive.

The inspection must be done by competent divers and a full and accurate report should be generated.

When Hydrex carries out the inspections there is the added benefit that we can immediately follow up with any needed repair or maintenance work since Hydrex divers are qualified and competent in all types of underwater hull and running gear maintenance and repair operations and are backed by a very knowledgeable technical team capable of rapidly resolving most underwater problems that a ship can run into.

Conclusions

It is far better and, in the long run can save a lot of money, to be proactive on the subject of underwater inspection, maintenance and repair rather than wait for emergencies or serious failures.

To go into drydock without a full underwater inspection one or two weeks ahead can be a serious waste of time and money.

It is worthwhile getting a really competent and comprehensive inspection and report done. If the company doing the inspection is also capable of carrying out any needed repair or maintenance work which the inspection finds necessary, this can represent considerable savings in time and money.

Hydrex is standing by to help any shipowner/operator cut costs and save money in any way possible through timely and competent underwater inspection, maintenance and repair. ■

The Hydrex technical department can help you save money by finding an on-site solution for your vessel's needs.

KEEPING SHIPS IN BUSINESS

KEEPING SHIPS IN BUSINESS

Keeping ships in business

Hydrex offers turnkey underwater repair solutions to shipowners wherever and whenever they are needed. Hydrex's multidisciplinary team will help you find the best solution for any problem encountered with your ship below the water line. We will immediately mobilize our diver/technicians to carry out necessary repair work without the need to drydock.

Hydrex has a long track record of performing complex permanent underwater repairs to thrusters, propellers, rudders, stern tube seals and damaged or corroded hulls. By creating drydock-like conditions around the affected area, our diver/technicians can carry out these operations in port or at anchor.

All the projects we undertake are engineered and carried out in close cooperation with the customer and any third party suppliers, relieving the customer of all the hassle of coordination, planning and supervision.

Headquartered in the Belgian port of Antwerp, we have offices in Tampa (U.S.A) and Algeciras (Spain).

All Hydrex offices have fully operational fast response centers where an extensive range of state-of-the-art equipment is available at all times.

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