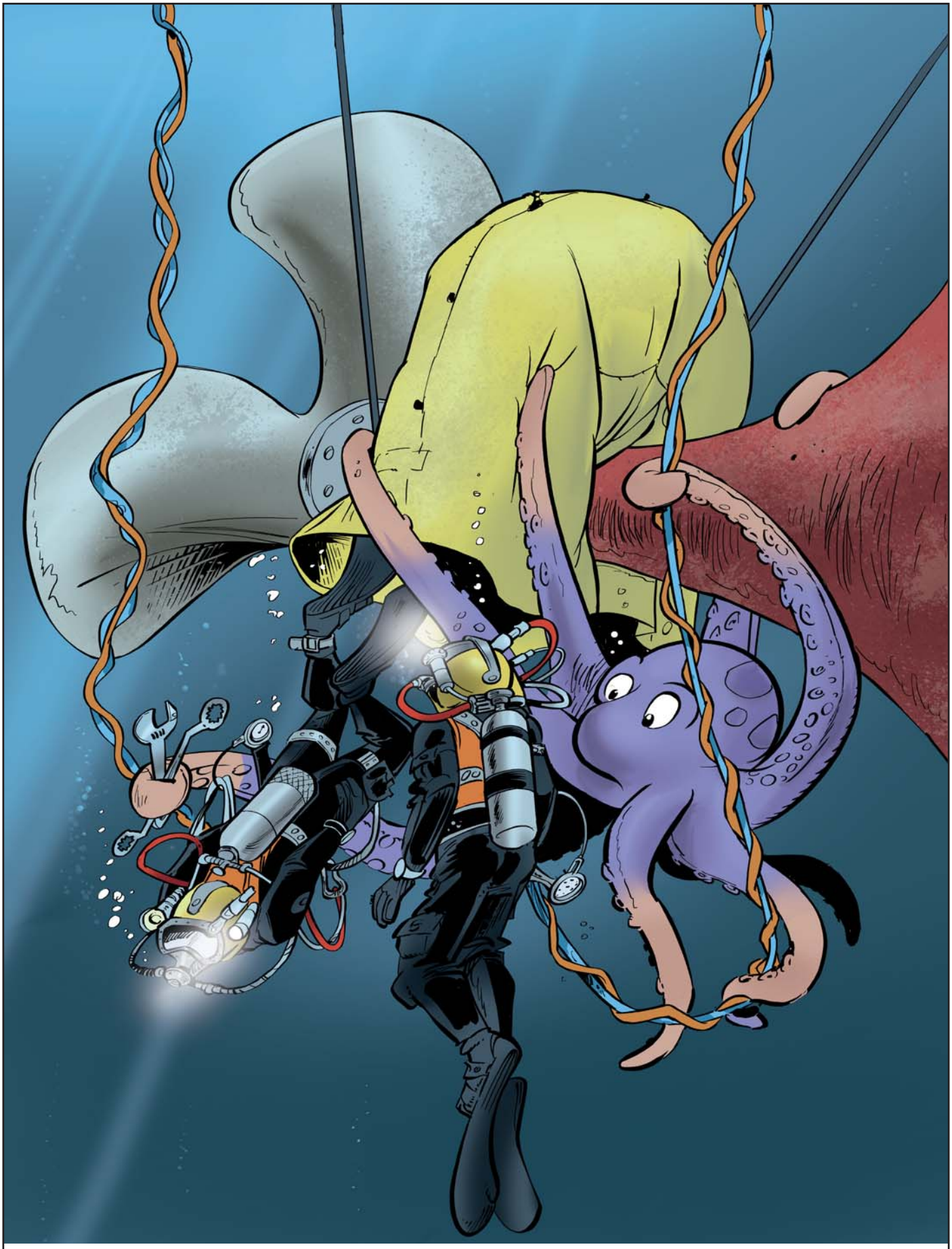
HYDREX®

UNDERWATER TECHNOLOGY

Magazine

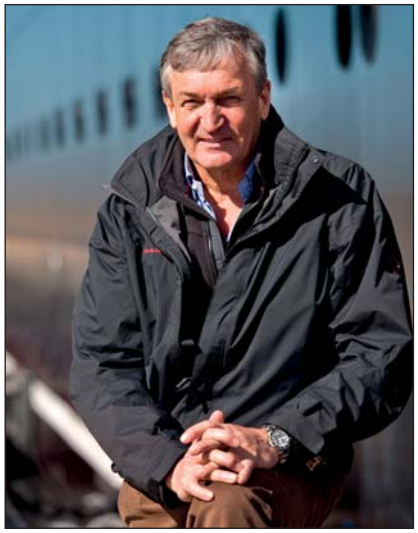
Number *207*



HYDREX®
UNDERWATER TECHNOLOGY

www.hydrex.be

Editorial



We have another magazine packed full with interesting information for you. We start off with a short explanation on how you can save 10% on your fuel bill in two easy steps. Be sure to contact us for more information if you want to take advantage of this simple method.

In the next article we give you an overview of all types of underwater repair and maintenance work our teams can perform to the propulsion gear of your vessel. By creating a drydock-like environment underwater, Hydrex divers can carry out these repairs while your ship stays in the water and on schedule.

Also in this magazine we write about three underwater hull repairs that were carried out on different types of vessels in Belgium and the Netherlands. While these repairs are smaller, they can nonetheless offer a large benefit for a ship owner, by avoiding an unscheduled visit to drydock.

We end the magazine with a propeller repair in Singapore. After the blades of a 300-meter container vessel were bent over angles up to 90°, Hydrex diver/technicians cropped all six blades of the ship. This was done to restore the propeller's efficiency as much as possible. As with all operations carried out by us, in-house developed equipment was used for this repair.

Best regards,

Hydrex founder
Boud Van Rompay

HYDREX N.V.
On Time Worldwide High Quality Underwater Services

ISO 9001 certified

Underwater services and technology approved by:

To receive a free copy, fax to:
Hydrex N.V. +32 3 213 53 21
or e-mail to hydrex@hydrex.be

HYDREX®
UNDERWATER TECHNOLOGY

Table of contents

Reduce your fuel bill by 10% now without going to drydock

There are two simple, easy and inexpensive steps that together can save you 10% of your fuel costs.

Propeller buffing is a new technique developed and delivered by Hydrex to keep your propeller in optimum condition. This is not conventional propeller polishing. Routine propeller buffing can save you 5% of your fuel bill, is very easy to schedule and carry out regularly, starting just as soon as you want to save 5% of your ship or fleet's propulsive fuel costs. This offers extraordinary Return on Investment (ROI) in terms of instant fuel savings. Very low outlay for very high returns and an extremely rapid payback.

Propeller boss cap fins (PBCF) can be installed by Hydrex divers anywhere, any time. This device is custom made for your ship's propeller. It can save an additional 5% of your fuel costs. There is a lead time of a couple of months for the PBCF to be made for your ship but Hydrex can install your new PBCF as soon as it's ready and you can start saving an additional 5% of your fuel bill immediately.

HYDREX PROPELLER BUFFING + PBCFs = 10% PROPULSIVE FUEL SAVINGS

Contact one of our offices today for more information and a quotation. ■

Propeller buffing can save you 5% on your fuel bill.

An underwater PBCF installation can save an additional 5% of your fuel costs.

Professional and permanent underwater repairs to all parts of a ship's propulsion system

Hydrex is renowned for bringing drydock-like conditions to the vessel or offshore unit. This helps owners to extend drydock intervals and eliminates the loss of time and production that docking entails.

Development of the cofferdam technology

Hydrex was the first company ever to use a prefabricated cofferdam, introduced as early as 1979 and used to carry out repairs to the m/v *Lunar Venture*. By 1983 the technology was in use to perform insert repairs in double bottom tanks. The company has advanced this concept extensively over the last 30 years, along with the technology to ensure that fast, professional and high quality work can be done while the vessel is *on-site* and even while continuing normal ship operations.

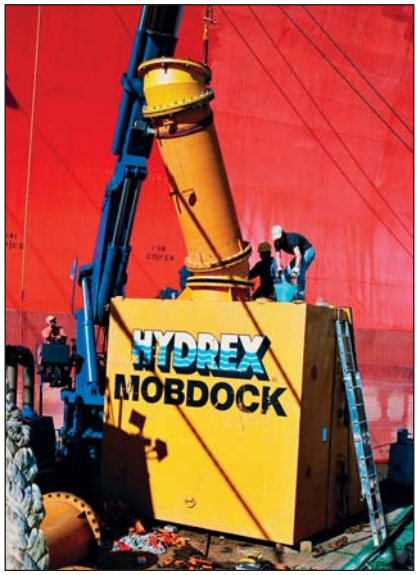
Training tanks and equipment in fast response center.

For its innovative work in this field Hydrex won the Lloyd's List SMM Award in the category of "Innovation in Naval Shipbuilding and Marine Technology."

On-site bow thruster operations

At the time of the award, these techniques were applied mainly to the repair and replacement of bow thrusters. Using steel mobdocks to seal off the thruster tunnel, with an access shaft protruding above the water, work teams accessed the tunnel and from there could work on the thruster in complete safety.

Hydrex has since then developed this technology further using lightweight flexible mobdocks. These



Rigid mobdock with access shaft used prior to development of flexible mobdock.


Positioning one of the new thruster blades.

Hydrex diver/technician preparing the bow thruster unit for blade installation.

modernized mobdocks, which are designed to be easily transported around the world, are used to close off the thruster tunnel on both sides, allowing divers to work in a dry environment around the unit and to reinstall the propeller blades of an overhauled thruster inside the thruster tunnel after the unit has been secured. They can also replace the blades or seals and perform repair work on a specific part without removing the unit. All of this is accomplished without the need to drydock the vessel.

Underwater stern tube seal repairs

In the summer of 1996, Hydrex divers carried out an underwater face seal replacement on a roro vessel. Face seal replacements had been carried out by our divers in the Antwerp workshop, but now they were able to actually perform this task while in the water. Since then Hydrex has constantly worked to advance the techniques used for stern tube seal repairs.

The Hydrex flexible mobdock creates a dry environment around the stern tube seals.

At the end of 1999 Hydrex started working on injections with lip type stern tube seals. In 2000 Hydrex carried out tests for wet bonding on lip type seals. These tests showed that wet bonding could only give an 80% result compared with dry bonding. Instead of giving up on replacing lip type seals underwater, Hydrex developed a procedure which avoids wet bonding but still accomplishes successful underwater seal repairs.

In 2002 the flexible mobdock was further developed so that a similar dry underwater working environment could be created around a stern tube seal assembly to facilitate repair work on the assembly and enable the replacement of damaged seals on-site.

Hydrex divers have used the flexible mobdock technique for both bow thruster and stern tube seal repairs

Hydrex diver/technician during on-site stern tube seal replacement.

All Hydrex divers go through stringent training, allowing them to perform the wide range of underwater services Hydrex offers.

Hydrex diver working on the assembly during stern tube seal operation.

Hydrex diver/technician performing an inspection.

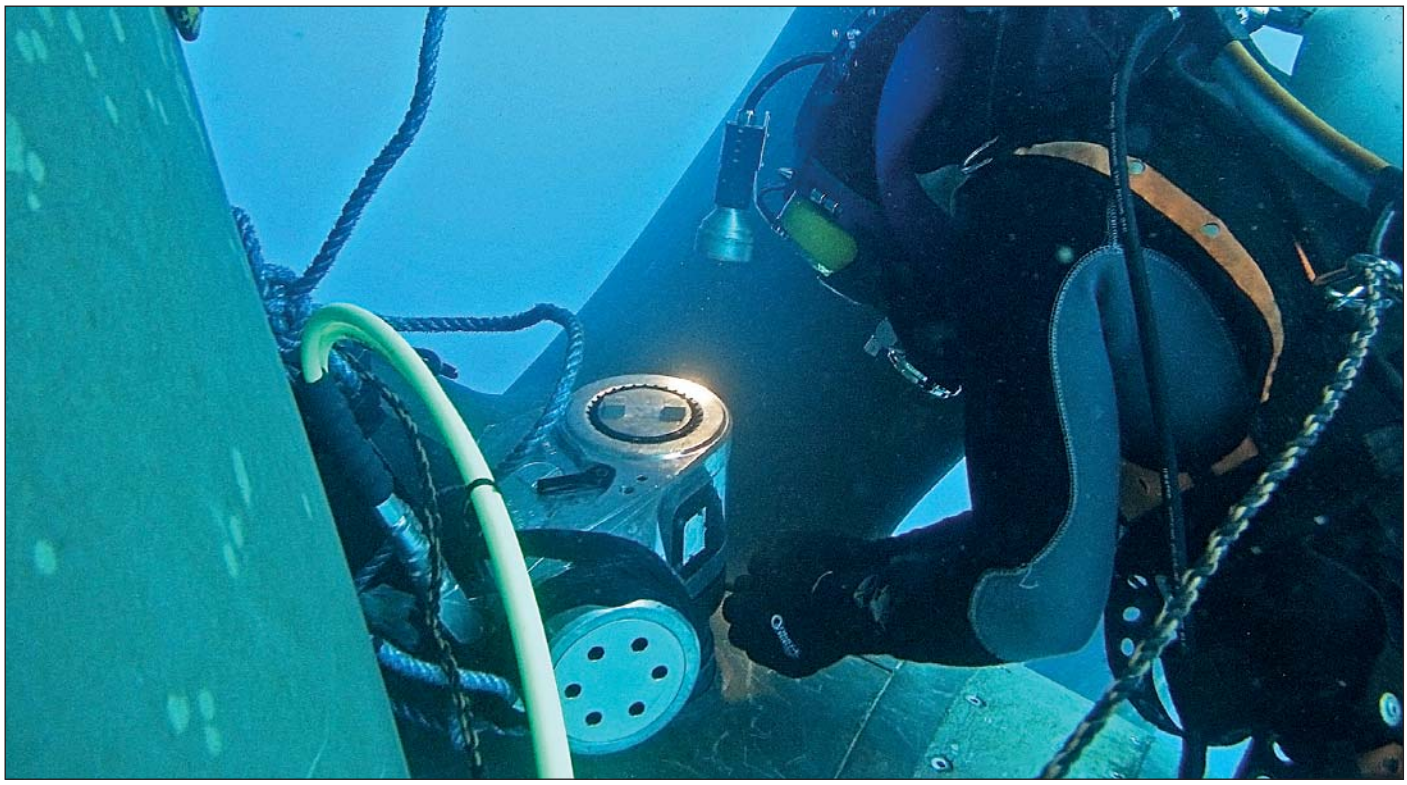
on numerous occasions during operations around the world. The company's success with these types of repairs earned it the prestigious Ship Repair and Conversion Award at Lloyd's List Global Awards.

Permanent underwater rudder repairs

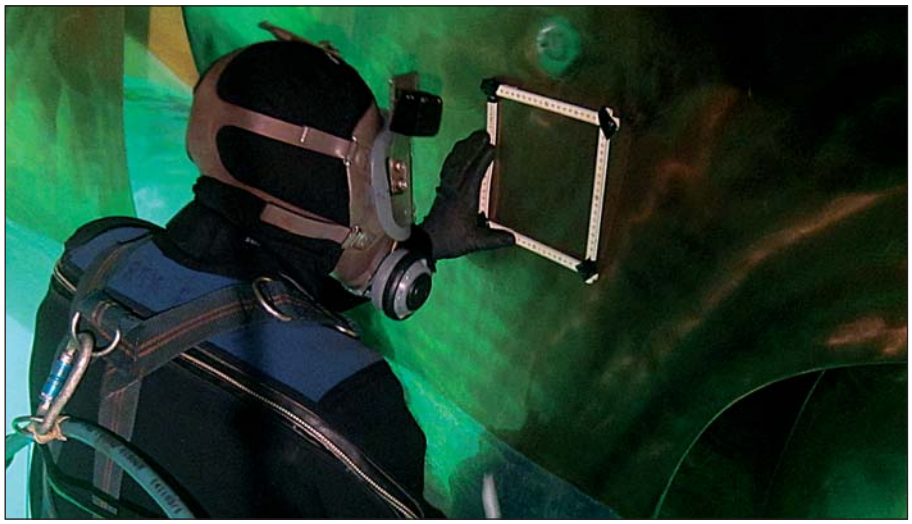
A new repair technique allows Hydrex to also perform permanent repairs on any type of rudder while the vessel remains at anchorage and cargo operations can continue. Permanent underwater rudder repairs were hitherto not possible and ships had to drydock in cases where a major defect was found. The equipment can be mobilized very rapidly using Hydrex special flight containers for worldwide delivery of this service.

Permanent underwater repairs to all types of propellers now possible

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 machine, which was 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. A new model of the straightening machine was recently introduced. It is compatible with the existing model and is used to restore more severely bent propeller blades to their original condition.



Previously not all propeller repairs could be carried out on-site.



Hydrex diver/technician performing a propeller blade inspection underwater, in a dry environment.

Cropping work on a blade of a cruise vessel's propeller.

If the damage is beyond repair, our team will crop the damaged blade, along with a corresponding section of the opposite blade to restore the hydrodynamic balance. This kind of repair is carried out with the propeller blade cutting equipment originally developed by the Hydrex research department in 1985 and improved over the intervening years.

The Hydrex R&D department has also developed a repair system that allows Hydrex to perform permanent underwater repairs to every type of propeller in dry conditions. All kinds of repair or maintenance work can be carried out to propellers, twin propellers, variable pitch propellers, azipod and collapsible thrusters.

This is especially important news for supply vessels, navy ships or any vessel under contract or on a location far away from available dry-dock facilities. Staying on hire for underwater repairs will save precious time and money.

This new repair system can rapidly be transported by air to any location around the world from the Hydrex fast response centers at very short notice. It can be assembled very quickly (12 hours) on-site.

Conclusion

Hydrex continues to invest in the research necessary to keep evolving the available repair techniques along with continual training and development of its engineers and diver/technicians. With the implementation of the techniques described in this article, our teams can perform permanent repairs to all parts of the underwater ship propulsion system in drydock-like conditions. ■

KEEPING SHIPS IN BUSINESS

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.

HYDREX®
UNDERWATER TECHNOLOGY

Specialized repair and diver teams can be mobilized immediately from the Hydrex offices.

Fast underwater hull repairs in Belgium and the Netherlands

Recently Hydrex teams have carried out on-site hull repairs on vessels berthed in Belgium and the Netherlands. Doubler plates were welded on a 214-meter roro ship in Antwerp and an 85-meter cargo ship in Flushing, while an insert plate was installed on a 199-meter cargo vessel in Antwerp.

Heavily corroded bottom plating and frames on cargo vessel.

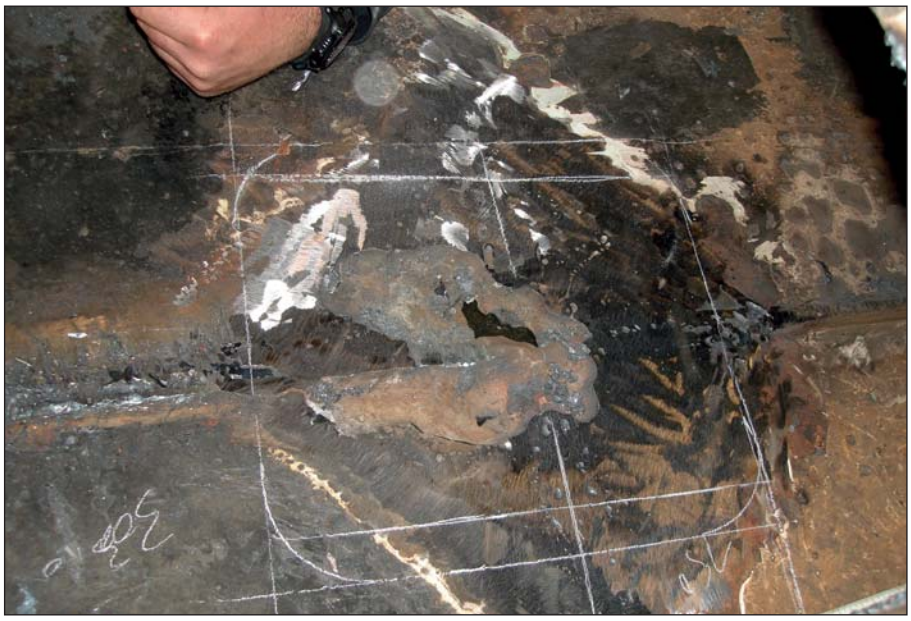
Hydrex on-site hull repair services include the renewal of both small and large areas of damaged hull plating. These repairs can be carried out above or below water, according to the circumstances, with tailor-made mobdocks. Normal commercial activities can therefore continue without disruption. These operations follow the Hydrex procedure for welding cracks in the vessel's shell plating and they are approved by the major classification societies.

Grinding work on the corroded bottom plating of the cargo vessel.

Hydrex diver/technician teams carry out these on-site hull repairs all over the world. In most cases the damaged area can be replaced with a permanent insert and no condition of class is imposed. This was the case with the operation on the cargo vessel in Antwerp.

Permanent repair prevents drydocking

A 350 x 300 mm insert was installed over several corrosion holes in the flat bottom plate of a 199-meter cargo vessel during the ship's stay in Antwerp. Once the area was declared gas free, the diver/technician team positioned and secured a cofferdam over the outboard side of the damage. Next they cut away the frames covering the damage and removed a plate the exact size of the new insert. After the insert had been secured with full penetration welding, the class surveyor present



The area to be replaced was marked off.

New insert plate positioned.

Fully welded insert plate on cargo vessel in Antwerp.

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.

HYDREX®
UNDERWATER TECHNOLOGY
Phone: + 32 3 213 5300 (24/7)
Fax: + 32 3 213 5321
hydrex@hydrex.be
www.hydrex.be

approved the repair. The team then installed new frames because the old frames were too corroded. The divers worked in shifts to perform the operation as fast as possible.

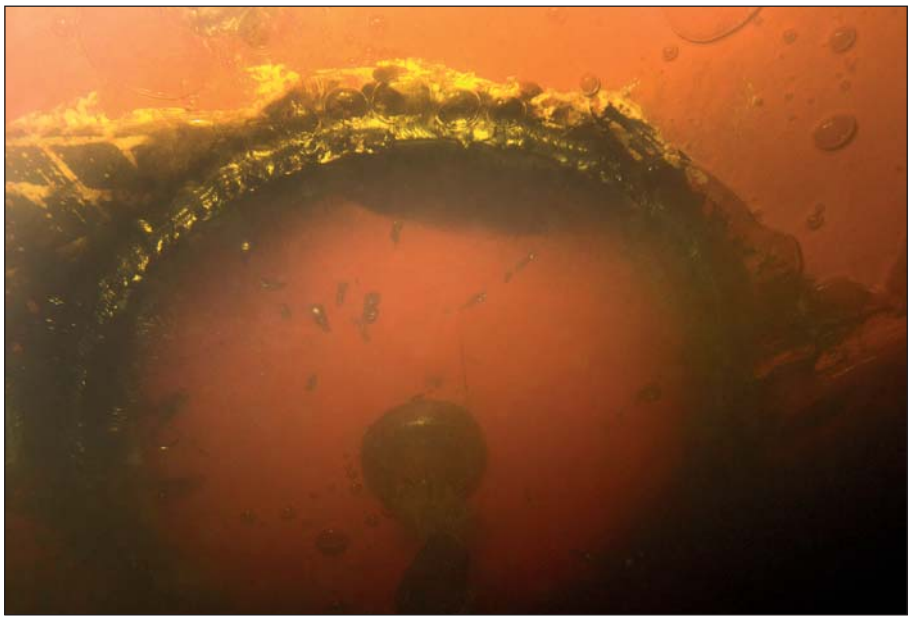
Doubler plate installations in under 24 hours in Antwerp and Flushing

On the rare occasions where the damage does not allow such a repair, a temporary doubler plate is installed over the affected area. This allows the owners to keep to their schedule and have a permanent repair carried out during the next scheduled drydock visit.

In less than a day, a Hydrex diver/technician team positioned and secured a doubler plate over a hole in the water ballast tank of a 214-meter roro vessel. The plate, with a diameter of 300 mm, was installed during the ship's stop in Antwerp. In Flushing divers installed a 40-mm doubler plate over two tears in the flat bottom of a 85-meter cargo ship.

The repairs described in this article were performed according to the Hydrex class approved procedures. Like all Hydrex operations they followed the essential professional standards to ensure the future safety of the ship.

Our divers are specifically trained to perform a wide range of procedures; they stayed in close communication with each other and with the technical department in the office, throughout these operations. This allowed them to finish these jobs within the shortest possible time frame and without any compromise of the high quality standards Hydrex is known for. ■



Doubler plate installed over corrosion hole in hull of roro vessel.

Two tears in flat bottom of cargo ship.

Hydrex truck and equipment next to cargo vessel in Antwerp.

New generation propeller repair equipment used for cropping in Singapore

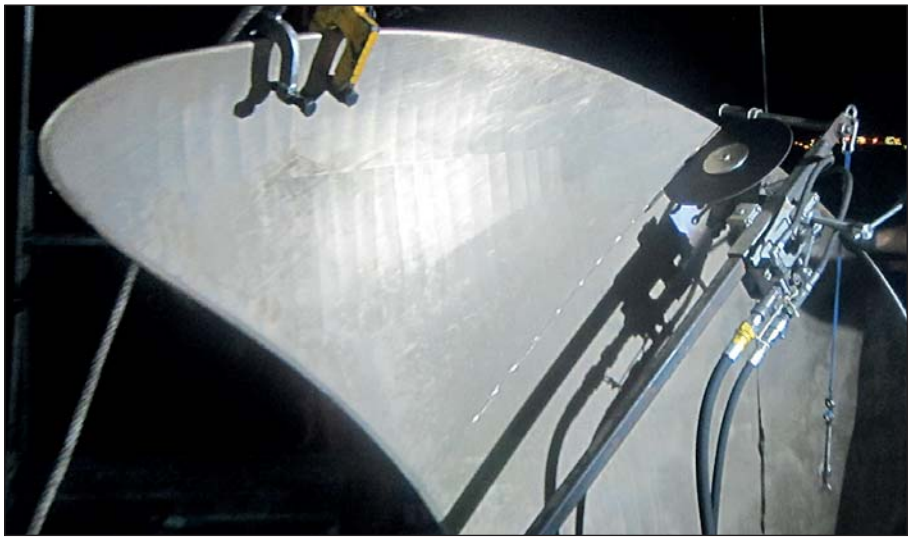
Recently a team of Hydrex diver/technicians performed a propeller blade operation on a 300-meter container vessel in Singapore. All six blades of the vessel's propeller were damaged and needed to be cropped.

Having developed different procedures for different kinds of damage, Hydrex is equipped and trained to make the best 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 example 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.

The six blades of a container vessel's propeller were severely bent. An on-site solution was needed to restore the propeller's balance and efficiency. A Hydrex diver/technicians team was therefore rapidly mobilized to the ship's location to restore the

The propeller blades of a 300-meter container vessel were severely bent.



The blades were cropped one by one to restore the propellers balance.

The ideal cutting line was calculated and marked on the propeller blades.

One of the cropped propeller blades, prior to having its edges grinded.

Hydrex technicians cropping one of the propeller blades.

damaged blades to as close to their original condition as possible.

Because the ship could be trimmed enough to bring the blades above water, a scaffolding was installed around the propeller. This allowed the team to perform the operation in the dry.

The operation started with a detailed survey of the affected propeller blades. The inspection revealed that the six 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 one by one to give them the correct radius. When the cropping was complete, the blades were polished to make sure that any remaining loss of efficiency would be minimal.

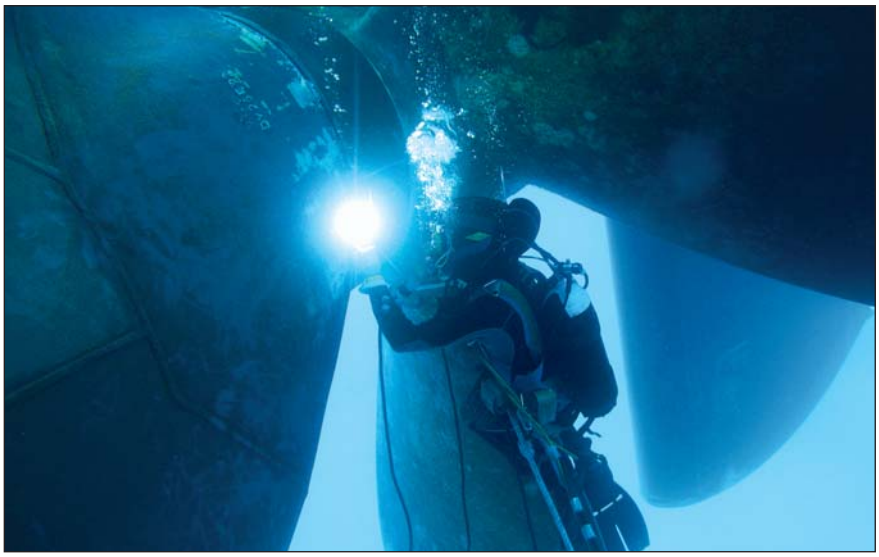
The success of the operation was confirmed by the customer. After the

Hydrex US ready to mobilize immediately

Hydrex has an office located in Clearwater in the Tampa Bay area that is ready to mobilize immediately. The office has a fast response center that is equipped with an extensive range of state of the art logistics, trucks, tools and diving support equipment. This enables Hydrex US to efficiently service vessels and offshore units calling on ports in Canada, North, Central and South America as well as the Caribbean.

All staff members of the Hydrex office in Clearwater undergo stringent training at the Hydrex headquarters in Antwerp. They can carry out both simple and complex high quality jobs even in the harshest of circumstances.

Repairs to thrusters, propellers, rudders, stern tube seals, damaged or corroded hulls and all other underwater repair and maintenance services are done while the vessel is on-site. This eliminates the need to dry-dock.



All used methods are fully approved by all major classification societies.

www.hydrex.us

KEEPING SHIPS IN BUSINESS

Hydrex US
604 Druid Rd,
Clearwater, FL 33756
Phone: +1 727 433 3900 (24/7)
Fax: +1 727 433 3990
info@hydrex.us

operation the vessels completed sea trial and "managed to increase RPM up to 93 and developed 21 knots," said Maxim Bolduev, Deputy Fleet Manager Southern Shipmanagement. "Before propeller trimming we got 53 RPM and only 14 knots."

Conclusion

Our R&D department is constantly looking into ways to enhance the available propeller repair techniques even further to improve our services. New models of both the straightening and the cutting machines have recently been put into service. These allow us to straighten blades that could previously only have been 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 on-site and underwater, allowing the ship to return to commercial operations without the need to dry-dock. ■

Hydrex technicians cropping one of the propeller blades.

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.

HYDREX®
UNDERWATER TECHNOLOGY

Headquarters Hydrex N.V. - Antwerp
Phone: + 32 3 213 5300 (24/7)
E-mail: hydrex@hydrex.be

Hydrex Spain - Algeciras
Phone: + 34 (956) 675 049 (24/7)
E-mail: spain@hydrex.be

Hydrex LLC - Tampa, U.S.A.
Phone: + 1 727 443 3900 (24/7)
E-mail: info@hydrex.us

www.hydrex.be