HYDREX®

UNDERWATER TECHNOLOGY

Magazine

Number *333*

Scrubber pipe repairs and lasting protection

Exhaust scrubbers filter out all harmful toxins from exhaust gases of marine diesel engines. These hazardous pollutants can severely corrode the pipes of the scrubber. Using the experience we have accumulated over the years allows us to assist you at moment's notice if this happens.

We offer a full package to owners that are experiencing similar damage. Not only can we replace the corroded exhaust pipe while your vessel stays on schedule, but we can make sure that you will not have to call us again in a few months time for the same problem. This is done by coating the pipes with a highly corrosion resistant coating called Ecospeed.

Contact us for more information on scrubber pipe replacements or other underwater repairs. We are at your disposal 24/7.

HYDREX®
UNDERWATER TECHNOLOGY

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Editorial

Underwater inspections represent only a very small cost, but if properly done they have the potential to save an owner a great deal of money. Pre-docking inspections carried out by competent divers and followed by comprehensive and accurate reports can detect problems while the ship is still afloat.

This allows you to make preparations for any repair work that needs to be done during docking. The most efficient schedule can be devised, and any required material and equipment can be on-site and ready for the repair as soon as the vessel comes out of the water.

We can also save you time and money by carrying out preparatory work before the ship has entered drydock. A good example of this is a scheduled thruster overhaul. Our teams can remove the unit for overhaul while the ship is still afloat. When the vessel enters drydock, the unit is ready for reinstallation without any delay.

If you have questions about pre-docking inspections or operations, do not hesitate to contact us. We are available 24/7 and our teams are ready to mobilize almost immediately.

Hydrex founder
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ISO 9001 & 45001 certified

Underwater services and technology approved by:

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HYDREX®
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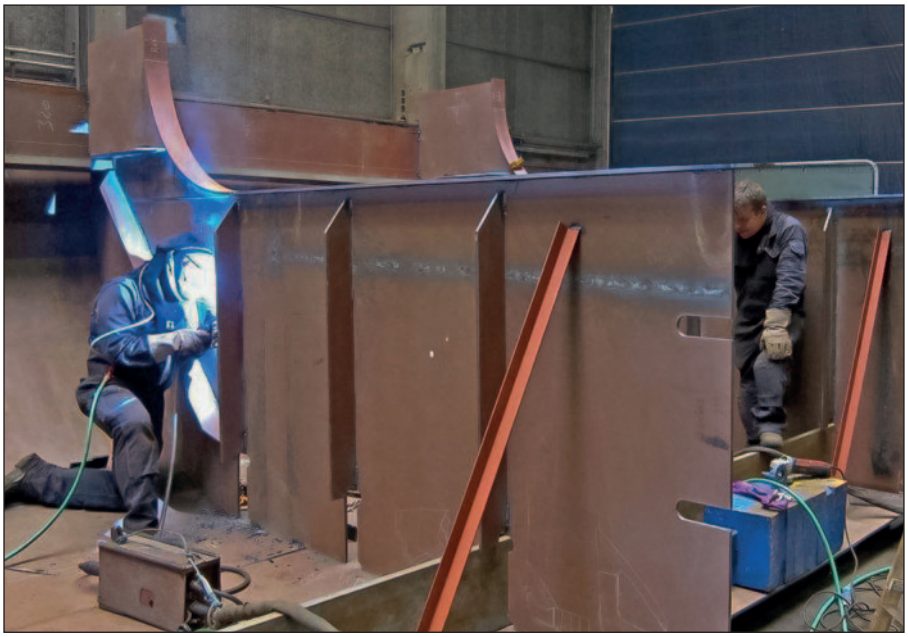
Complex steel repairs carried out afloat

Hydrex has an in-house Research & Development department that can take care of the engineering aspects of an operation. In this way turnkey solutions can be offered for complex hull and other repairs that require the construction of specific equipment.

All the projects we undertake are engineered and carried out in close cooperation with the customer and any third-party suppliers. We begin with evaluating the feasibility of an underwater repair, continue through design and construction of customized equipment and go all the way through to successful execution of the repair or replacement and subsequent follow-up. We take on, organize and execute the entire job, start to finish, relieving the customer of all the hassle of coordination, planning and supervision.

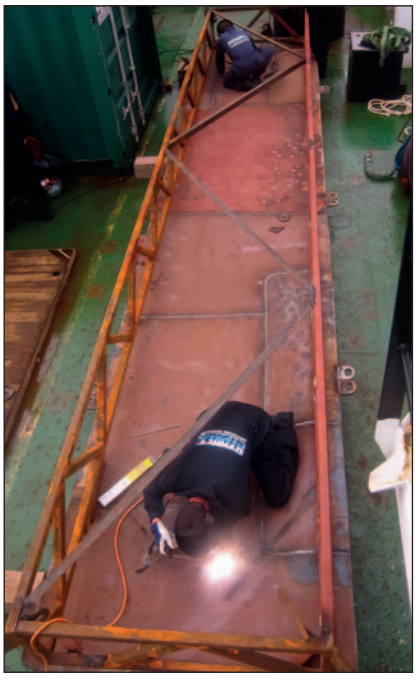


Fabrication of the section used to repair the 5 x 5-meter hole in the aft section of the hull of the bulk carrier Navios Sagittarius.

Below you can read some examples of the many customized solutions our R&D department has designed for ship owners over the last 50 years.

Replacement of a complete, prefabricated hull section at anchor

In July 2011 the Tsavliris Salvage Group urgently dispatched a salvage



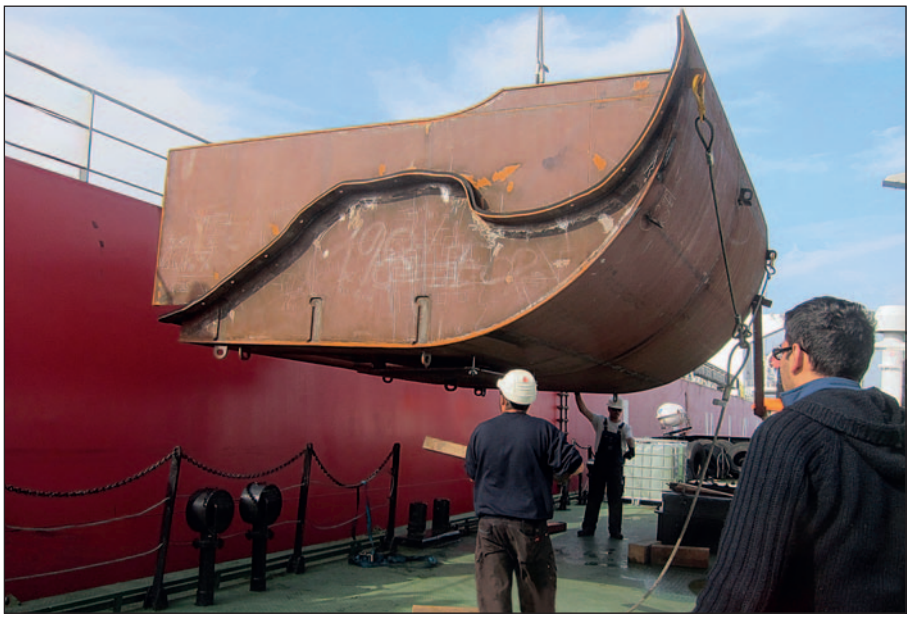
Preparing and lowering the doubler plate into the water so that it could be welded in place to repair the 8 x 1.8 m rip in the hull near the forepeak of the Navios Sagittarius.

tug in response to a call for assistance from bulk carrier *Navios Sagittarius*. The vessel had run aground on the Tonneberg Banke, about 23.5 miles east of Frederikshavn, Denmark.

The vessel was towed to Frederikshaven for a detailed underwater inspection, extensive bottom repairs, and reloading of cargo. The chief subcontracting company for the inspection, planning and repair work was Hydrex. The complex salvage operation lasted three months.

Without accurate measurements and data, the naval architects could not produce drawings and plans which would make this repair possible. So, the first step for the Hydrex divers was to perform a detailed inspection of the two major areas of damage on a hull that was badly deformed, pierced, torn and indented.

Using these measurements and the original drawings of the ship, the naval architects were then able to produce final drawings from which a section and a doubler plate could be fabricated and installed. As soon as fabrication of the section and the doubler plate was completed, preparation for installation began. In the case of the section, it was necessary to cut through the hull plates where the hull was distorted and broken. Divers proceeded to cut a hole in the hull about 5 x 5 meters in size. The prefabricated insert was lowered into the water and rigged into place with chain blocks. While work was going ahead with the section, another Hydrex team worked on the fabrication and installation of the 8 x 1.8 m doubler plate in the area of DBBT No. 1. A frame was fabricated and used for measurement and then the plate itself was cut, preshaped and attached.



The finished section being lowered into the water in Denmark.

Speed was of the essence for this operation as the ship was on a long-term charter and each day it was out of service was costing tens of thousands of dollars. It was the first time ever that an entire hull section had been prefabricated and inserted into a ship's hull, cutting away the existing damaged plates, with the ship still afloat.

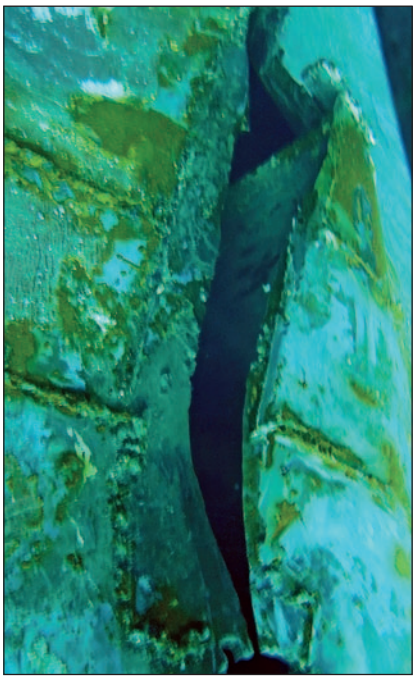
Underwater repairs in the U.A.E. allow ship to sail on after a 150-meter large grounding damage

Almost back-to-back with the operation described above, we sent a nine-man diver/technician team to a 300-meter bulker's location, 21 miles off the coast of Fujairah, United Arab Emirates. The ship's shell plating was indented over a length of 150 meters after a grounding in the Suez Canal, and a large crack 1.5 meters long appeared, making it impossible for the vessel to sail any further. We were asked to close off the crack to allow the vessel to continue its route.

The flooding had lowered the fully loaded ship from a draft of 18 meters to 22 meters. Because such a water depth means shorter diving intervals, a large diving team was immediately mobilized to the vessel to allow the team to work continuously for the 12 hours that were available each day.

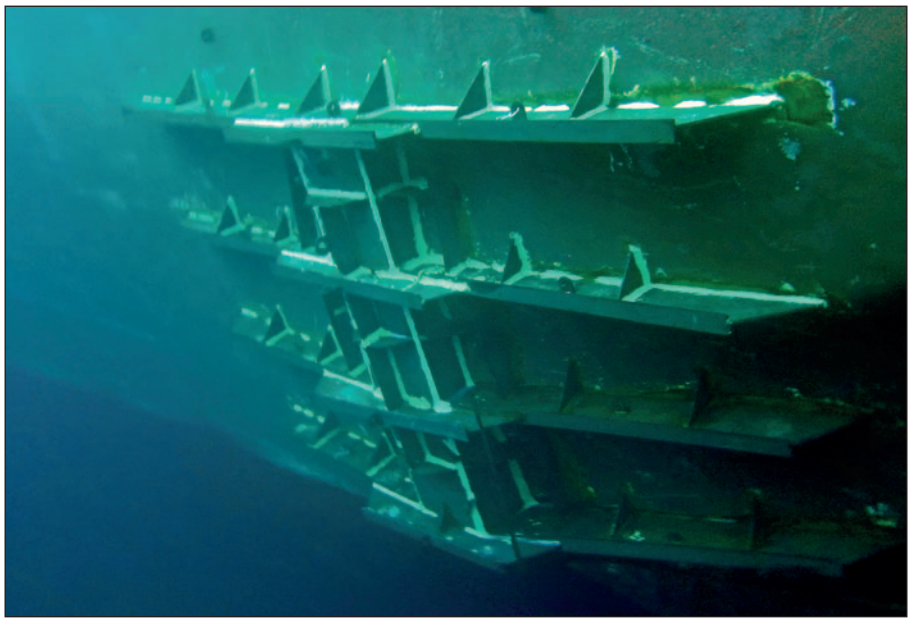
To get a perfect assessment of the way the shell plating had been compressed, a special frame was made and secured over the damaged area. This allowed the diver/technician team to take exact measurements of the distorted plating. These measurements were then used to create a special cofferdam that would cover the crack and prevent it from growing further.

After the cofferdam had been positioned and secured, it was reinforced with longitudinal stiffeners and additional fortifications until it was strong enough to hold the water pressure. The tank behind the crack was then emptied, bringing the vessel back to its previous draft of 18 meters. In total the reinforcements covered an area of 18m^2 and the combined length of all the welds was over 500 m.



A crack of 1.5 meter appeared after the grounding of a 300-meter bulker, making it impossible for the vessel to continue its voyage.

A rotating diver/technician team was mobilized to Fujairah to make sure that the operation could continue for 12 hours each day, despite the working depth of 22 meters.



The cofferdam made it possible for the bulker to sail to China for unloading.

When the operation was finished, only a few reinforcements had to be added to the inside of the hull to prepare the ship for its journey to China.

Emergency hull repair on ferry *Texelstroom*

When the vertical side of the ferry *Texelstroom* was damaged during storm *Eunice* in 2022, a leak in the ballast water tank prevented the ship from sailing. Because this happened at the start of a busy school vacation period, it was essential that a fast on-site solution was found to keep the downtime for the ship as short as possible.

Texelstroom sails between Den Helder on the Dutch mainland and Texel, the largest and most populated Dutch Wadden Sea island. As a UNESCO World Heritage Site, it is important that the area be protected. *Texelstroom* was designed with this in mind.

We were asked by TESO, the owners of the vessel, to find a way to repair the damage the ship had suffered during the storm. Because no drydock was available on such short notice, the operation needed to be performed while the vessel was afloat. Another important factor was the timeframe. Downtime needed to be kept to the absolute minimum so that *Texelstroom* could get back to ferrying passengers between Den Helder and Texel as soon as possible.

Our Technical Department proposed installing an open-top cofferdam over the damaged hull plating. This would allow our diver/technicians to access the affected area and perform the needed repairs in dry conditions.

On Friday morning our team arrived in the port of Texel with the cofferdam and all the needed equipment. In consultancy with the superintendent of the ferry and the surveyor from the classification society it was

Hydrex welder cutting away the old plating from inside the open-top cofferdam on the ferry Texelstroom.

The Texelstroom *sails between Den Helder on the Dutch mainland and Texel, the largest and most populated Dutch Wadden Sea island.*

The insert on the ferry was welded by our certified welders.

agreed to install an insert repair measuring 1500mm x 700mm.

The team then installed the open-top cofferdam over the damage and created a dry environment in which to work. They cut away the old plating and installed the new insert. Our men secured the insert with a certified weld both from inside the vessel and inside the cofferdam.

The teams worked in shifts around the clock. This allowed us to complete the actual repair in just two days.

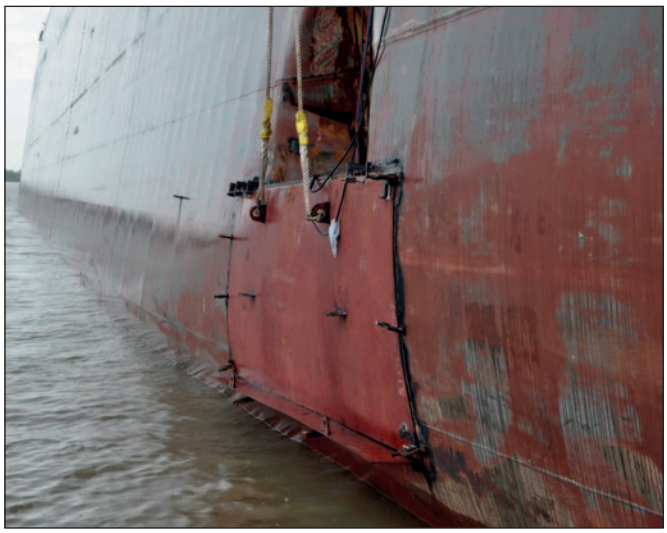
TESO's spare ferry *Dokter Wagemaker* had been bringing passengers to the beautiful Island of Texel during the *Texelstroom's* sick leave, but the ship was all better now and ready to sail again at full strength.

Extensive doubler plate repair in Ivory Coast allows bulker to sail after collision

In 2013, a 190-meter bulker suffered severe collision damage in Lagos, Nigeria. A large hole in the hull plating prevented the ship from sailing at full speed. The classification society also demanded that the vessel go to drydock immediately unless an on-site solution was found. Hydrex therefore sent a diver/technician team to the vessel's location to carry out an emergency doubler plate repair at anchorage. This would give the owner the opportunity to take his ship to drydock when he wanted and where he wanted.

Because of the rainy season in Nigeria, underwater visibility was almost non-existent, and the current was too strong to carry out repairs at anchorage. Abidjan was the closest

A full inspection of the damage on the bulker in Abidjan



The doubler plate was fitted to the slightly rounded shape of the hull.

Hydrex certified welders securing doubler plate on bulker in Abidjan.

location suitable for this type of operation.

At this new location the team cut away part of the deformed plating. This created an even surface to position the doubler plate. Next the team made crack arrests to make sure that the cracks would not spread any further.

The bottom part of the doubler plate was then lowered from the deck and positioned over the lower half of the opening. This part of the plate was 4.5 meters wide and 2 meters high. The diver/technicians then welded the plate onto the hull. Horizontal stiffeners were then installed on the plate to give it extra strength. This could not be done in advance because it would have prevented the team from adjusting the plate to the exact shape of the damaged hull.

The same procedure was repeated for the top part of the doubler plate. This part of the plate was trapezium-shaped with a width of 4.5 meters and a height of 2.5 meters. Both parts of the plate were then welded together to finalize the repair.

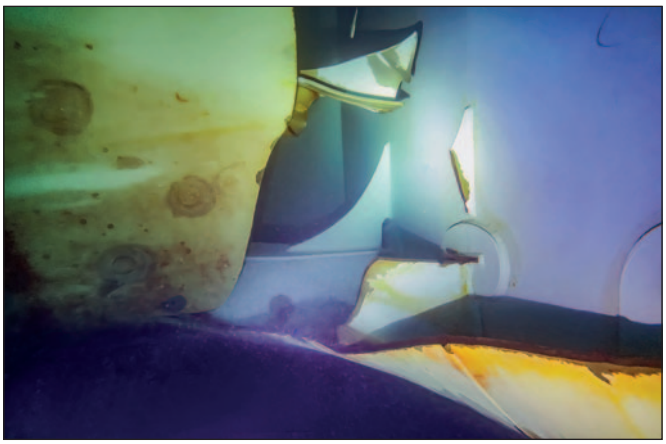
45-ton cofferdam repair after a severe grounding

A fully laden bulk carrier suffered heavy damages from a grounding in Suez in 2022. The owners' and management's first thought was to call Hydrex. In this case the ship was carrying a valuable cargo and every day she was out of action represented a huge loss to the owners.

Based on the initial inspection and rough measurements, a plan was proposed to carry out precise measurements of the hull where the large damage occurred so that a cofferdam could be designed which would then be installed to make the hull watertight so that the water ballast tanks could be pumped out.

As soon as the fabrication was completed by a local workshop, we flew back to Suez. After some needed modification, the massive, 45-ton cofferdam was lowered into position by crane and secured against the hull.

The pressure of the water was, however, too much for the structurally weak hull which started to cave in when the ballast tank began to be pumped out. It became clear that the ship had suffered too much internal damage to permit the water ballast tanks to be fully pumped out. This was not something that could have been predicted or remedied with the ship afloat.



Severe damage to the hull of a bulk carrier from the grounding in Suez.

Crane barge moving the 45-ton cofferdam into position.

Welding the cofferdam in place.

When the ship arrived in drydock, the sheer size of the cofferdam could be appreciated.

In order to reinforce the bulkhead between the water ballast tanks, a new plan was proposed to build cement boxes and pour concrete to provide enough strength for these bulkheads. But WBT 2 port could not be emptied. Part of the plan, therefore, was to lighter the ship as necessary until the class-required draft could be achieved.

With the cement boxes in place, the cofferdam was fully secured, and successful sea trials were conducted. The cofferdam remained firmly in place until it could be removed when the ship was in drydock and permanent hull repairs could be carried out.

Summary

Our goal is to offer customers the most efficient solution, whether the required services involve the inspection of a vessel's condition along with any required maintenance work, or highly technical major repairs and replacements of a ship's external underwater equipment and machinery. In all cases we strive to reduce cost and off-hire time for customers while maintaining the highest quality standards of repair and maintenance.

If you have a problem with a ship, or any underwater structure for that matter, give us a call. We will evaluate the problem and let you know whether an underwater solution is feasible. If it is, we will provide you with a clear cost and time frame. You would be amazed at what can be solved without the need for drydocking. ■

High quality in-water ship re

Permanent insert repairs
Specialist class approved insert repair work carried out on a permanent basis. Providing a real alternative to drydock.

Emergency repairs
Fast response emergency repairs worldwide.

Inwater video inspections
Professional video surveys provide a reality of the problem and enable owners and classification surveyors to directly diagnose any problems.

Echo sounder inspection and replacement

Speed log
Checks for damage, marine fouling and replacement.

Bow thruster and propellers
Permanent on-site repair, maintenance and replacement with the award winning flexible mobdock technique.

Hull cleaning on suitable coatings

Bilge keel
Check and repair broken welds, renewal of sacrificial anodes.

pair and fuel saving services

Start saving fuel with your propeller cone fin now

We regularly install propeller cone fins on different types of vessels. We can carry out these operations underwater, out of drydock, all over the world without interrupting the ship's schedule.

Propeller cone fin after arrival on-site, ready for installation.

Propeller cap energy saving devices can recover energy loss of a propeller hub vortex in the propeller's slipstream. This decreases fuel consumption from 3% up to 5% according to the manufacturers, and reduces cavitation on rudders and hulls.

Flexibility and speed are the watchwords for Hydrex when assisting a customer with this kind of operation. As soon as the propeller cone fin is ready for delivery, we can plan the installation based on the ship's schedule. Because our divers per-

Hydrex diver during removal of the old propeller cap.

Old propeller cap lifted onto the quay side.

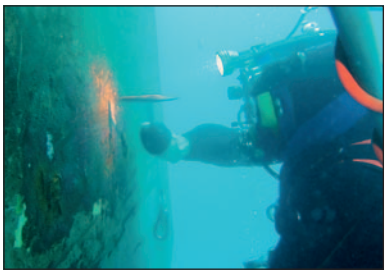
form these operations in a single day and during cargo operations, we have considerable freedom in choosing the best time and location for the installation.

A direct result is that an owner can instantly benefit from the fuel savings a propeller cone fin brings. He does not have to wait until the next scheduled drydocking for the installation.

Hydrex installs propeller cone fins underwater on any size and make of propeller, on both recently launched or older vessels. We carry out these operations following the specific


Final check of the propeller cone fin before installation.

Hydrex underwater inspections



Underwater inspections are an essential aspect of ship repairs. Building upon conventional technical skills and know-how while also taking advantage of the latest technology, Hydrex offers a unique hull monitoring service to its customers. This gives shipowners total control of the underwater hull and the underwater gear of their vessels. An informed decision can then be made concerning any required follow-up action. Catching problems early can save you much money in the long run.

Hydrex diver/technicians can carry out inspections underwater and onsite very swiftly without disturbing the vessel's sailing schedule.

With fuel costs amounting to 40% of operational expenses and continuing to rise, reducing fuel consumption is a vital concern of shipowners. This is the reason why hull monitoring pays for itself. Underwater hull roughness, marine fouling, bent propellers and poor paint condition are all factors that will increase fuel usage due to the drag or inefficiency created by the damaged or affected area. The data gathered can then be used to see if actions are required.

Our diver/technicians are trained for a wide range of operations and they can carry out the inspections in port or at anchor anywhere in the world.

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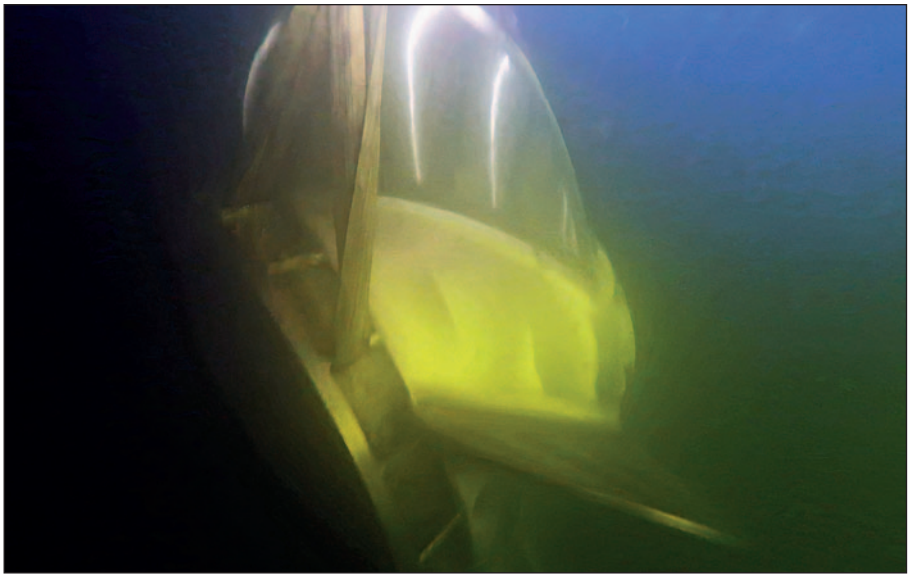
New propeller cone fin lifted with the crane of one of our workboats.



Propeller cone fin in the water just before being fitted onto the propeller.

procedures required by the OEM involved, adapted for an underwater installation.

After a preliminary inspection, the divers remove the existing propeller cap and clean the flange where the device is to be installed. They then lower the new propeller cone into the water and position it on the propeller. The bolts are inserted with the correct torque and secured. Hydrex teams can work in shifts around the clock to finish the operation as quickly as possible.

The owner of the vessel can start enjoying the fuel savings the propulsion improving device creates right away. Not having to wait for the next scheduled drydocking to have the propeller cone fin installed can win him up to four years of fuel savings. Since he will have earned back the cost of the underwater installation in only a few weeks, the savings are considerable. ■

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You can contact us at:
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KEEPING SHIPS IN BUSINESS

Inwater propeller repairs

When damage to propellers occurs due to impact with ice and other debris we can help you, even if the damage is quite extensive. Our teams can restore the propeller's balance and efficiency.

By taking advantage of the in-house developed cold straightening technique, damaged blades can be straightened underwater, allowing the ship to return to commercial operations without the need to drydock.

If straightening is not an option, the affected area of the blade will be cropped. This is done to achieve the greatest possible efficiency. Cropping is carried out using our propeller blade cutting equipment.

Our teams can also carry out any other repair work on the propeller. Examples of this are the removal and reinstallation of entire propeller blades or replacement of the propeller seal ring.

Contact us for more information on underwater propeller repairs. We are at your disposal 24/7.

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