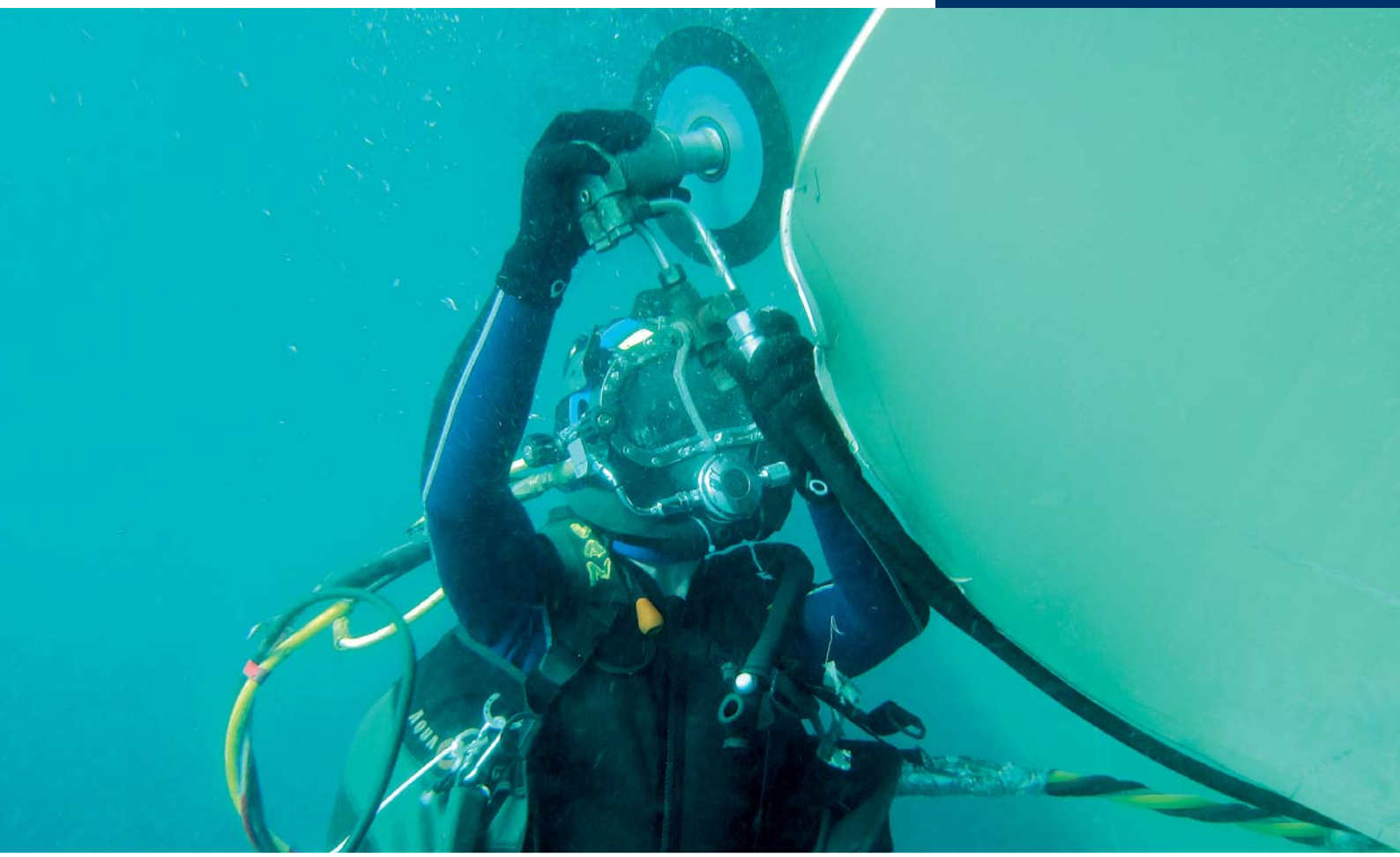
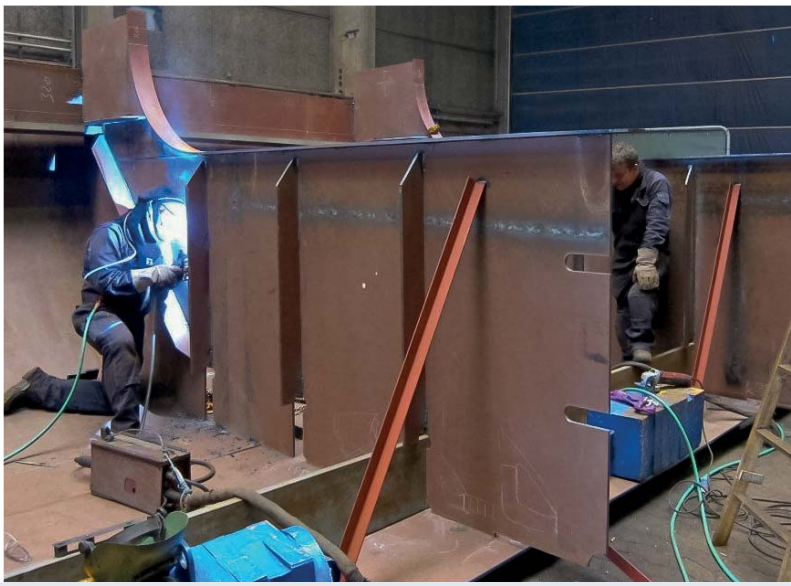
HYDREX®

UNDERWATER TECHNOLOGY

NEWS

LETTER | 274





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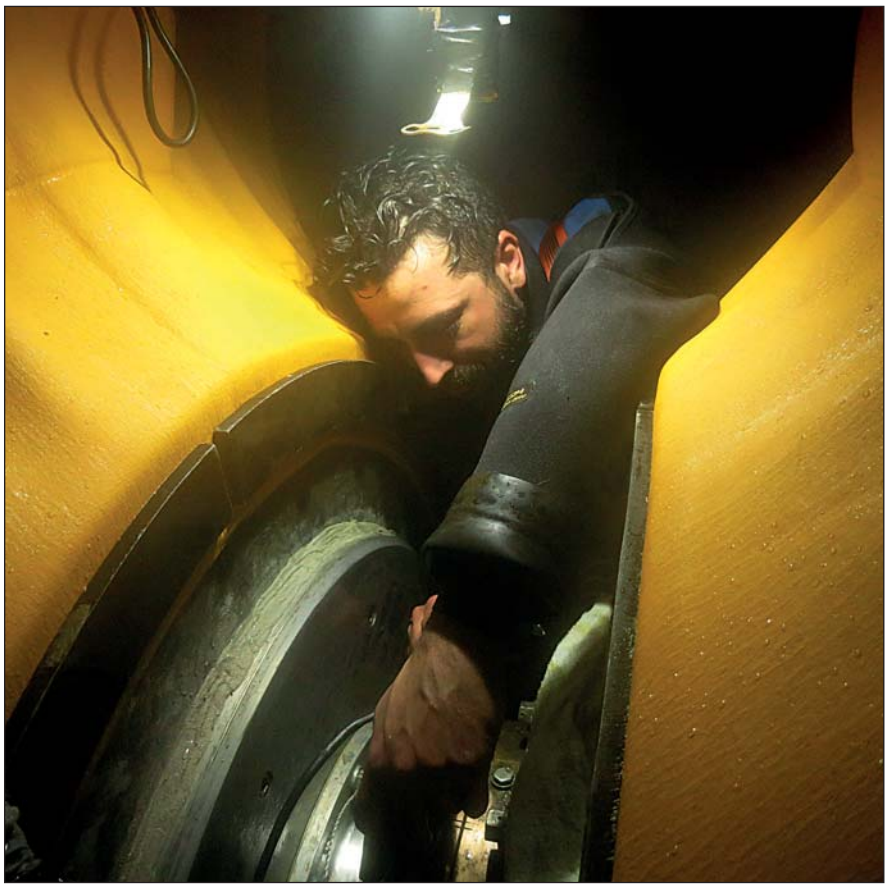
KEEPING SHIPS IN BUSINESS

ISO 9001 certified

Underwater services and technology approved by:

Stern tube seal repairs



Using our flexible mobdock method to create a dry underwater environment, we have carried out stern tube seal repairs and replacements underwater for some years now in cooperation with OEMs.

This technology brings drydock conditions to the ship rather than having to take the ship to drydock, saving a considerable amount of time and money in doing so.

This class accepted method is performed by our diving teams under our warranty. It can be used while the ship is carrying out its usual cargo or other commercial operations in port.

Visit the special stern tube seal repair section on our website for more information and examples of the many seal repairs we have performed in recent years.

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Our range of propeller repairs restore efficiency and save money

When damage to propellers occurs due to impact with ice and other debris we can help you, even if the damage is quite extensive.

A ship with bent or cracked propeller blades might experience severe vibrations while sailing. The classification society might demand a repair before the vessel is allowed to continue its voyage. Our teams can restore the propeller's balance and efficiency, resulting in class approval.

Hydrex diver working on the trailing edge of a damaged propeller blade.

Straightening, cropping and any other repair done afloat

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 dry-dock.

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.

Below you can read some recent case studies that illustrate the wide range of afloat operations our teams can carry out anywhere in the world.

Hydrex diver during underwater propeller blade cropping.

Underwater propeller blade straightening in Tenerife

One of our diver/technician teams traveled to Tenerife for an underwater propeller blade straightening on a 246-meter cruise ship.

The crew of the ship had noticed that the engine was overloading. This was the result of damaged propeller blades that were performing below average. The engine had a higher workload, leading to an increased fuel consumption and added stress.

A detailed survey of the ship's two propellers by our team revealed that the four starboard side propeller blades of the vessel were bent. A fast, on-site solution to restore the propeller's balance and efficiency was needed. Luckily the port side propeller blades were in good condition and did not require any repairs.

The team positioned the straightening machine over the bend in the trailing edge of the first damaged blade. In close communication with the team leader in the monitoring station on-shore, the divers returned the bent blade to its original state. When the straightening was complete, our technicians cleaned the blade to make sure that any remaining loss of efficiency would be minimal. The same procedure was then repeated on the other three blades.

Diver positioning our propeller blade straightening machine.

Hydrex diver getting ready for underwater propeller operation.

Severely bent propeller blades on cruise ship in Tenerife.

Underwater blade cropping in Vietnam

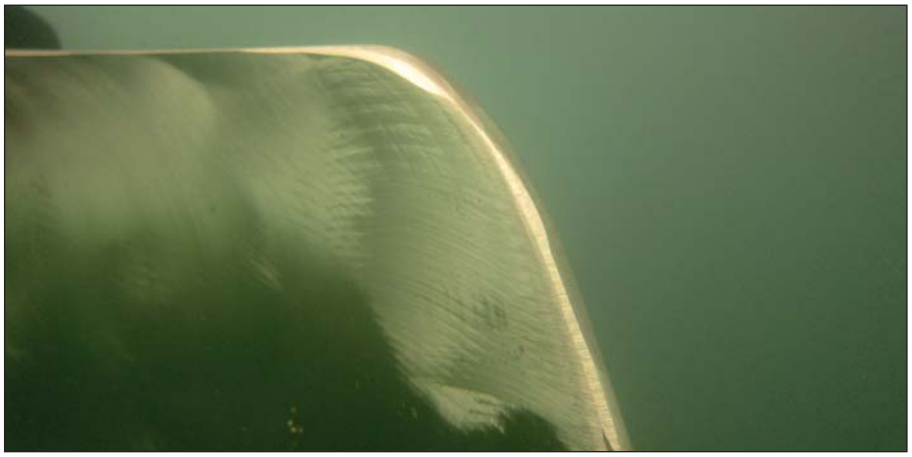
The four blades of a 190-meter bulk carrier's propeller were severely bent. An on-site solution was needed to restore the propeller's balance and efficiency. A team was therefore mobilized to Cẩm Phả, Vietnam.

Our men started the operation with a detailed survey of the affected propeller blades. The inspection revealed that the four blades were bent over angles of 90 to almost 180 degrees.

The team then used the information acquired during the inspection to calculate and determine the exact measurements needed to modify the trailing edges of the propeller blades.

Bent propeller blades of bulk carrier in Vietnam.

Cropping the damaged blade.



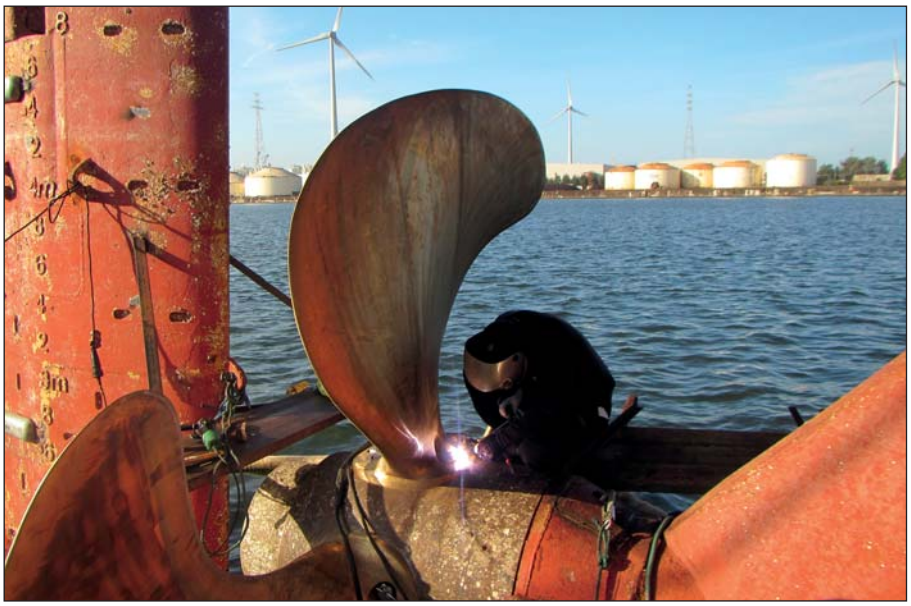
Cropped and polished propeller blade of bulk carrier.

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

Propeller blade removal and reinstallation in Belgium

An oil tanker needed its four propeller blades overhauled during a stop in Ghent, Belgium. We sent a team to the vessel's location to remove the blades on-site and reinstall them when they returned from the workshop.

The operation was carried out while the vessel was alongside and trimmed so that the blades could be surfaced one by one. Our men started the repair with the installation of chain blocks to rig the first blade. They then removed the blade bolts and lifted the blade. A blind flange was installed to prevent water



Welding the securing of the bolts.

Blade repositioned over the propeller hub.

Propeller with overhauled blades ready to sail.

ingress during the overhaul. The ship crew then turned the propeller 90° to surface the second blade. Our technicians repeated the same procedure on all four blades.

While the blades were transported to the workshop and repaired, our men carried out several other operations on the vessel. A full inspection of the propeller hub was done, as well as an inspection of the blade carriers and the propeller shaft. The team also installed new anodes on the rudder. By combining these operations, time between the removal and reinstallation was used as efficiently as possible.

When the blades arrived back on location, they were installed using the reverse procedure. The operation was finished swiftly to enable the owner to sail his ship with only the bare minimum of delay. A costly drydock detour was avoided.

Contact us

Our R&D department is constantly looking into ways to enhance the available propeller repair techniques even further. Our teams can do much more afloat than you might think possible.

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

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A world's first in underwater repair: the insertion of a complete, prefabricated replacement hull section at anchor

This year marks the 45th anniversary of Hydrex. We will be looking back at some of the many key operations our teams performed since the company was founded in 1974. We will do this by republishing an article from the vault of the Hydrex Magazine each month.

In 2011 we were the chief subcontracting company for the inspection, planning and repair work when the bulk carrier *Navios Sagittarius* had run aground and suffered severe damage to its hull.

It is hard to convey in a short article and a few photos the complexity and difficulties involved in carrying out a successful salvage operation of this magnitude to a vessel which had run aground so heavily and was so badly damaged and at risk, all under highly variable weather conditions and constant pressure to complete the repairs in the shortest possible time.

It was the first time that an entire hull section had been prefabricated and inserted into a ship's hull after cutting away the damaged plates, with the ship still afloat. This permitted the vessel to continue on a major voyage without the need to drydock. ■

This article was first published in January 2012.

Navios Sagittarius: behind the scenes at a remarkable salvage operation

In 2011 Hydrex was the chief subcontracting company for the inspection, planning and repair work when the bulk carrier *Navios Sagittarius* had run aground on the Tonneberg Banke, about 23.5 miles east of Frederikshavn, Denmark.

On the 23rd of July, a Hydrex diving team contracted by the salvors of the bulk carrier carried out a preliminary video inspection which found large penetrations, indentations and cracks in the hull, and heavily deformed plates. However, it was impossible to get a full picture of the damage with the ship still aground.

Fabrication of the section used to repair the 5 x 5 meter hole in the aft section of the hull, port side.

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 ship owners 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 on-site 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 ship owners. 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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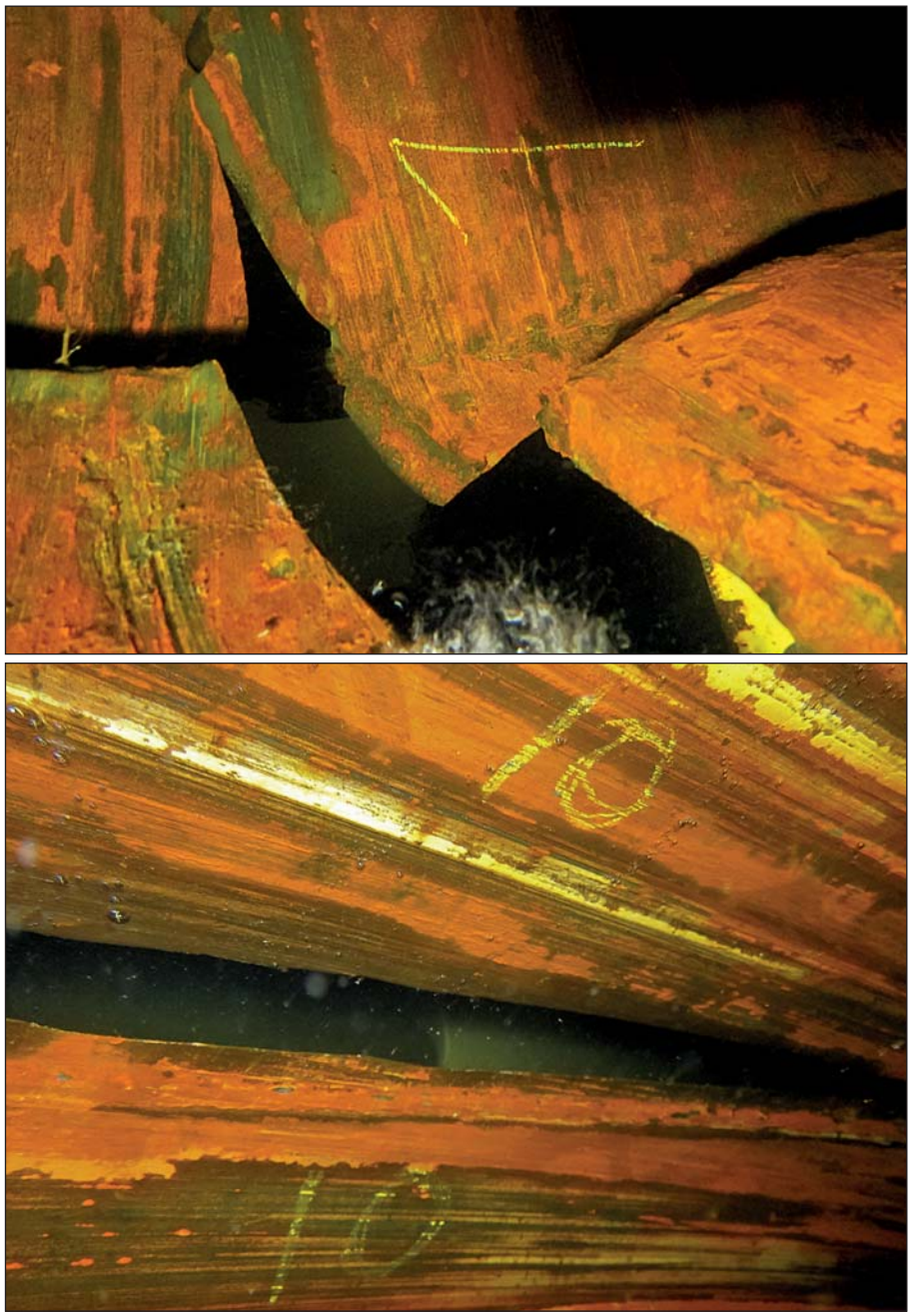


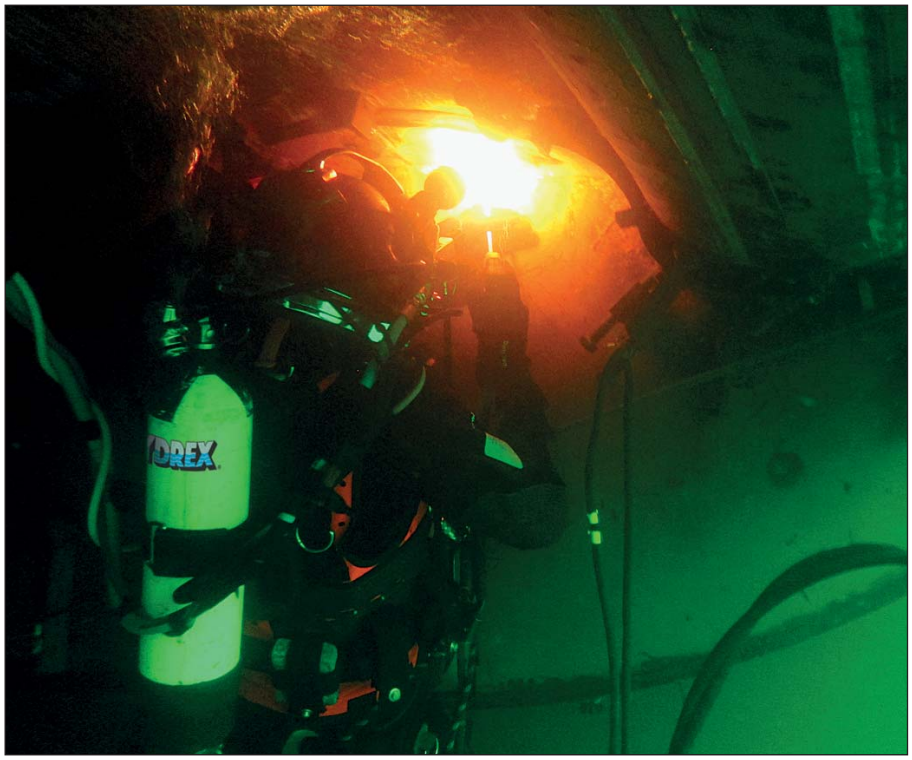
Severe damage to the hull as revealed by the detailed video inspection carried out by Hydrex divers.

On July 28th, after about 3,000 tons of cargo had been transferred to the lightering vessel, by pressurizing certain tanks and with the assistance of tugs, the *Sagittarius* was refloated. The vessel was towed to Frederikshaven for a detailed underwater inspection, extensive bottom repairs, and reloading of cargo.

Our diver/technician team examined the hull, took measurements and photographed and videoed the damage. They reported two very large holes in the hull, one about 5 x 5 meters aft on the port side and the other about 8 x 1.8 meters near the forepeak on the port side, as well as many smaller holes, cracks and indentations.

Using these measurements and the original drawings of the ship, the naval architects were able to produce final drawings from which a section and a doubler plate could be fabricated and installed. 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 distort-

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.



Repairs to smaller areas of damage where the hull was holed or cracked.

ed and broken. Our 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. The frame was fabricated and used for measurement and then the plate itself was cut, pre-shaped and attached.

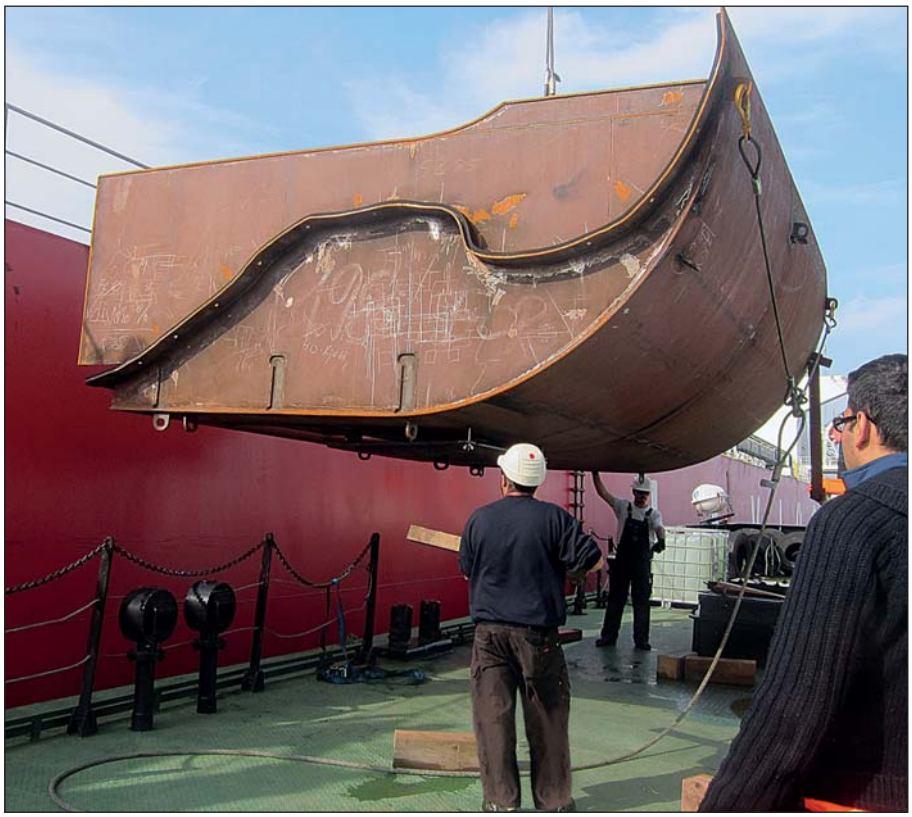
In addition to the repair of the two main areas of damage, there were many smaller holes and cracks which had to be repaired so that the vessel could sail. These holes and cracks were being repaired while the work of designing and fabricating the section and large doubler plate was going forward.

The final step for the salvor and the diving team was a full inspection of the underwater hull on CCTV in order to gain the approval of the classification society for the vessel to sail. The *Sagittarius* passed the inspection on October 13th and resumed passage under its own steam to its destination, China.

Conclusion

The successful manning of a 24-man team, mobilization, equipment, and execution of the work on a project of this size can only be undertaken by a large, well trained and experienced company. Hydrex was also running a large similar operation in Fujairah along with several smaller projects overlapping the *Navios Sagittarius* salvage operation and amounting in total to an additional 24 diver/technicians performing operations around the world.

As a note, speed was of the essence in this job 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 a testimony to the skill and conscientiousness of the divers and salvage team that after ten weeks and hundreds of meters of wet welding, the work was inspected and found to be excellent. ■



The finished section being lowered into the water and inserted into the cut-out in the hull using chain blocks.

If you have received this magazine at the wrong address or if your company is going to move, please let us know.

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KEEPING SHIPS IN BUSINESS

Hydrex is looking for representative agents

To support our continuous growth, we are expanding our worldwide network of Hydrex agents. This allows us to reach a much bigger public directly than would otherwise be possible.

All our offices have fully operational fast response centers where an extensive range of state-of-the-art equipment is available at all times for immediate deployment with our skilled diver/technician teams to wherever they are needed.

The services that we offer are highly specialized underwater and in water repairs. These include bow thruster repairs and replacements, stern tube seal repairs, hull shell plating repairs and replacements, in water surveys and various maintenance work. More information on our services can be found on our website.

Contact us if you are interested in joining our network and help us build a strong relationship with our prospects and customers. We look forward to hearing from you.

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Always on time

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 performs 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 we 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.

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