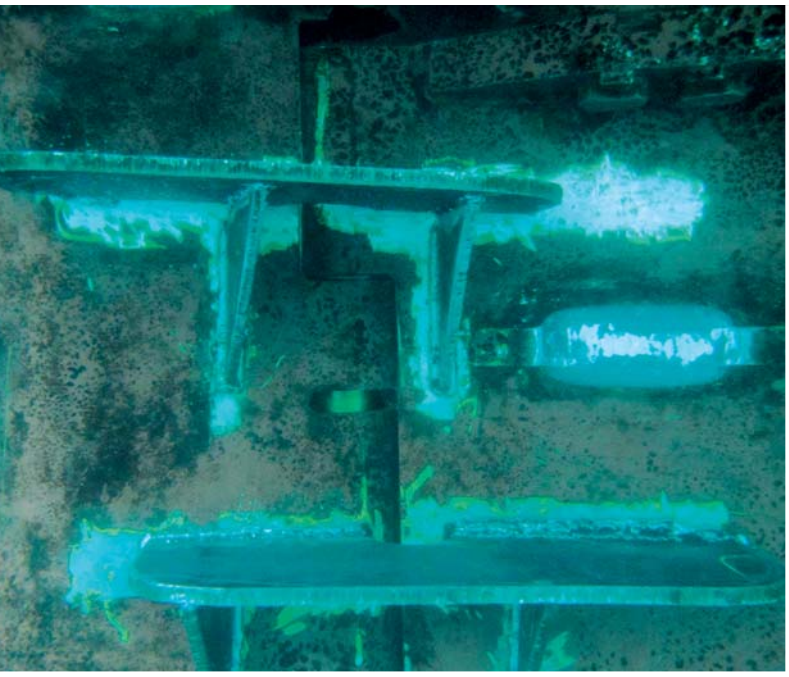
HYDREX®

UNDERWATER TECHNOLOGY

NEWS

LETTER | 238



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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 repair work on a specific part without 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.

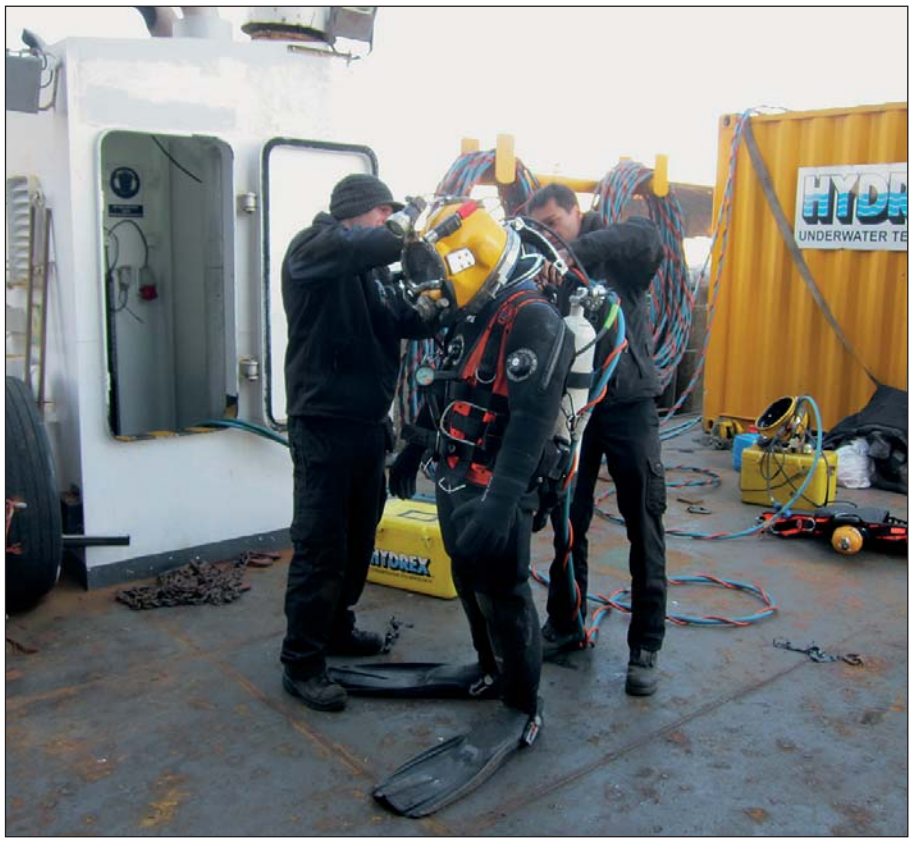
There is no need to send the vessel to drydock as all operations can be carried out in port or while the vessel is stationary at sea. Normal commercial activities can therefore continue without disruption.

Permanent afloat repairs with unique rudder mobdock

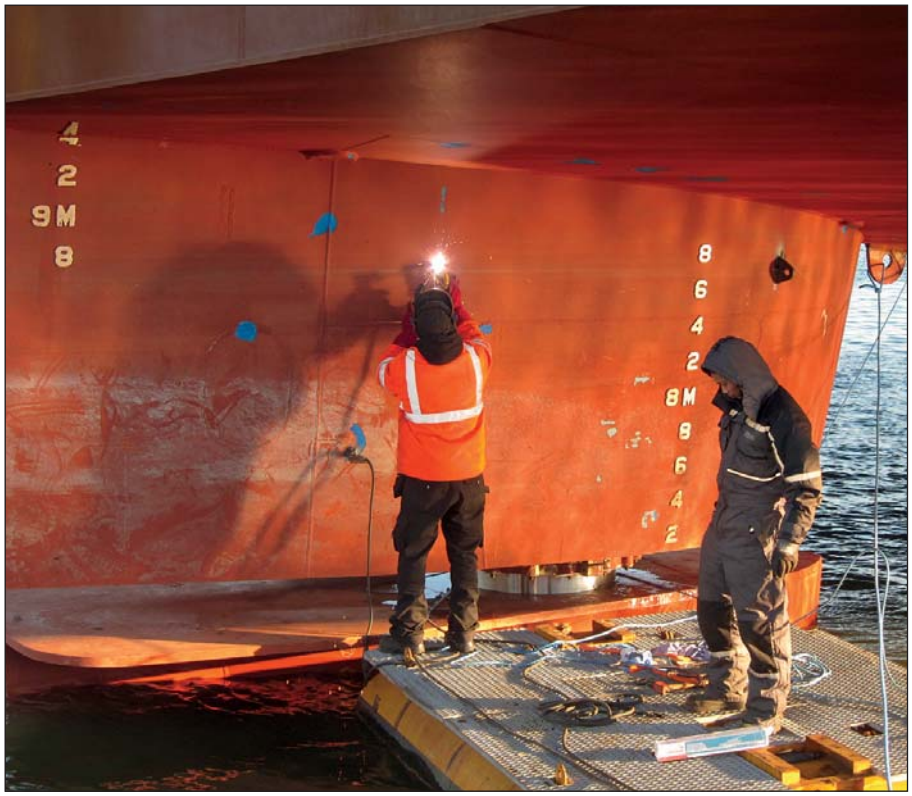
We perform repairs at anchorage on any type of rudder or while the vessel is berthed without interrupting cargo operations. In most cases these repairs are permanent and do not require follow up.

Permanent in-water rudder repairs were previously not possible and ships had to drydock in cases where a major defect was found. We have however designed equipment that allow us to perform permanent rudder repairs on-site. The equipment can be mobilized to any port in the world at moment's notice. This enables us to offer this service very swiftly on a worldwide basis.

Major defects on rudders very often cause unscheduled drydocking of ships. The technique designed by our R&D department allows engineers, welders and inspectors to perform their tasks in a dry environment with the vessel still afloat. With the use of our flexible mobdock technique class approved permanent repairs are now possible on-site. Steel repairs and replacements can be performed and other technical defects can be solved without the loss of time and money associated with drydocking.



Hydrex diver/technician getting dressed for underwater rudder operation.



Hydrex team members preparing the rudder.

Balanced rudder repair in Antwerp

Hydrex was contacted by the owner of a 200-meter vehicle carrier because the rudder of his vessel was not working properly. A diver/tech-

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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Hydrex diver/technician performing an inspection.

nician team therefore mobilized from our headquarters with one of the workboats loaded with all the needed equipment.

After arriving at the ship's location in Antwerp, the team first performed a detailed underwater inspection. This revealed several irregularities on the rudder seals.

Our universal rudder repair mobdock allowed the rudder specialist that was present to perform further inspections in drydock-like conditions. He could then make a detailed assessment of the situation of the rudder and observed several reasons for the malfunctioning.

Following the inspection we proposed a repair plan which was accepted by OEM and the owner. The team then carried out several repairs to remedy the rudder problems. First the existing rudder seal was tightened. Next the two wrong-sized rings were replaced with correct ones and both the upper and lower casing of the rudder seal assembly were reinstalled. The team pumped grease into the system and secured all nuts and bolts. The vessel could then continue its schedule with a fully functioning rudder.

Hydrex workboat with monitoring station and equipment on-site.

Rudder repair case studies

The following case studies give an account of some of the other more important recent underwater rudder repairs performed by Hydrex. They showcase the wide variety of repair solutions we can offer to shipowners.

Emergency flap rudder repair in Greenland

We received an enquiry for an emergency rudder repair on a 67-meter fishing vessel. The ship was operating in the region of Sisimiut, Greenland when a defect occurred on her flap rudder, making it difficult to navigate safely.

The top hinge of the rudder flap had come loose.

A preliminary inspection by a local diving company revealed that one of the hinges of the rudder flap had come loose. To keep on sailing without a repair posed a great risk as there was a real chance that the damage would have deteriorated. Securing the rudder flap was the only possible underwater solution.

This inspection, combined with drawings received from the OEM, gave our technical department all the information they needed to make the necessary preparations. Steel plates that would be required for the repair were prepared at a local workshop while our team mobilized.

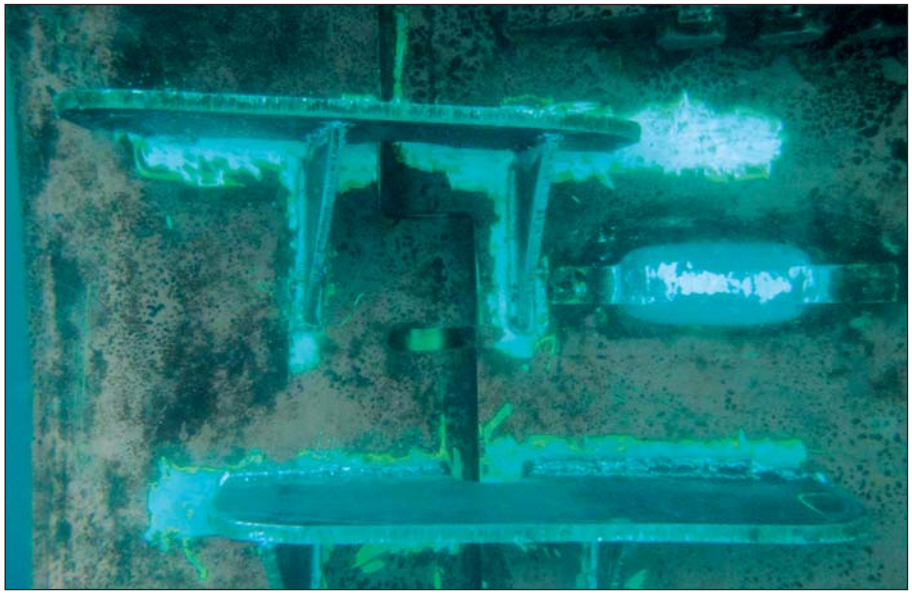
A team of our diver/technicians arrived at the remote location of the vessel just over a day after the green light for the operation had been given. The polar weather conditions of Greenland proved to be no problem for our divers, as they are experienced in delivering the same high quality in difficult circumstances.

Preparing the lightweight plates used to take exact measurements.

A secondary underwater inspection was performed by our divers to get the exact measurements for the girders. Next the plates were cut on-site by our team to the exact size. The rudder and its flap were then put in the neutral position. Three girders were placed on each side of the rudder, securing the flap to the rudder. The plates were welded underwater by our divers. A steering test was successfully performed, concluding the repair.

By immediately mobilizing a team to Sisimiut to carry out a temporary repair, we allowed the owner to keep

Monitoring station in polar winter conditions in Sisimiut.



Girders were used to secure the flap to the rudder.

his vessel operating instead of having to plan an unexpected docking. Because of the remote location of the vessel there was no suitable drydock close by. As a result this would have meant an extended off-hire time. With a well calibrated rudder the ship could keep on sailing until the next scheduled drydock visit.

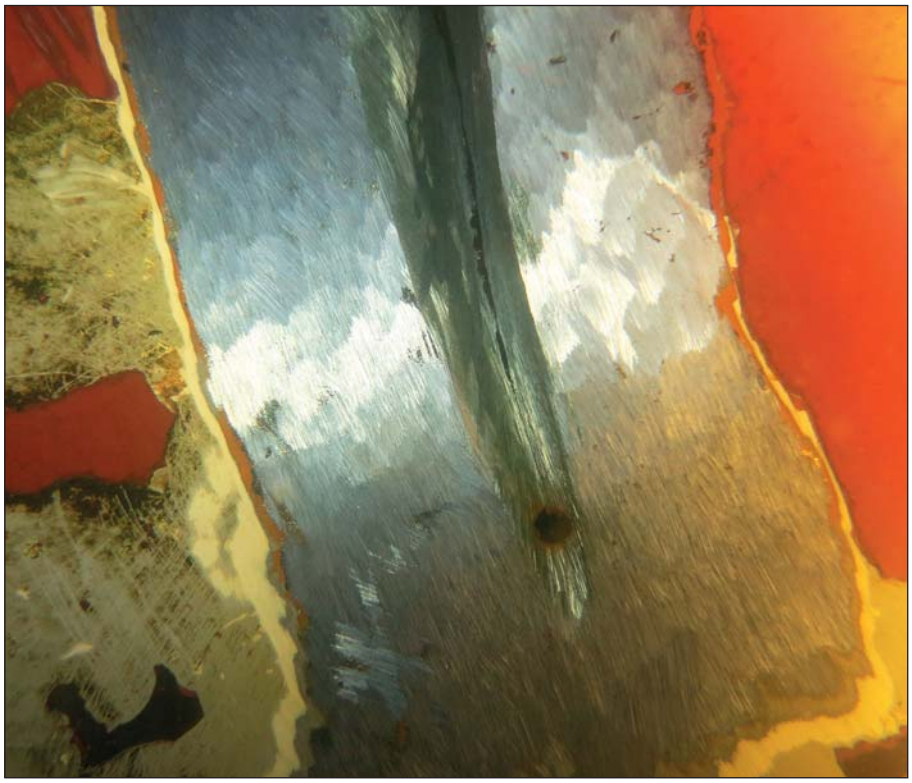
Underwater rudder plate repair in Haifa

When a 260-meter container vessel suffered a crack on its rudder, a Hydrex team traveled to Haifa, Israel to carry out a repair.

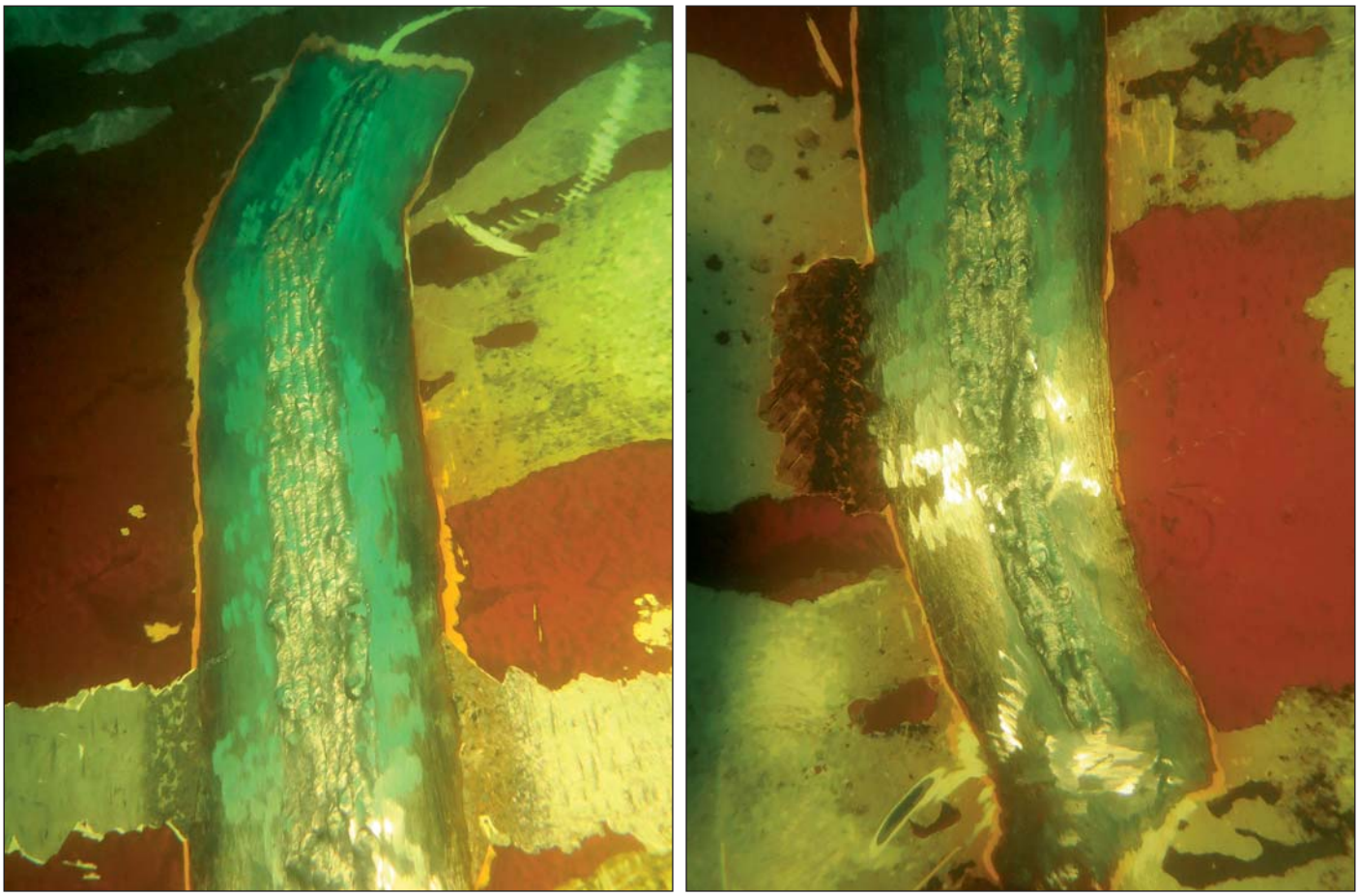
The divers started the operation with a detailed underwater inspection of the affected area. This was done under the supervision of a representative of the classification society. With the measurements taken during this inspection, a complete assessment of the damage could be made. This allowed us to create the best possible repair plan for the problem.

A 690-mm crack was found, partially covering the weld seam of the portside rudder cover plate. The crack was curved at the top and the bottom. Crack arrests had already been made at both ends to prevent it from spreading further. A more thorough solution was now needed to fix the problem.

In consultation with the class surveyor a repair plain was devised. First the Hydrex diver/technicians ground out the crack in a v-shape. They also ground the surrounding area. Then a root weld was put in the crack. Next the team filled the crack with welding beads. The repair was finalized with a steel reinforcement bracket that was installed over the



The crack and the surrounding area was cleaned and ground first.



After the crack was filled, the vessel could sail until the next scheduled docking.

middle of the area.

A successful pressure test was performed to make sure that the dry rudder compartment behind the crack was not compromised. The surveyor then gave his approval for the repair.

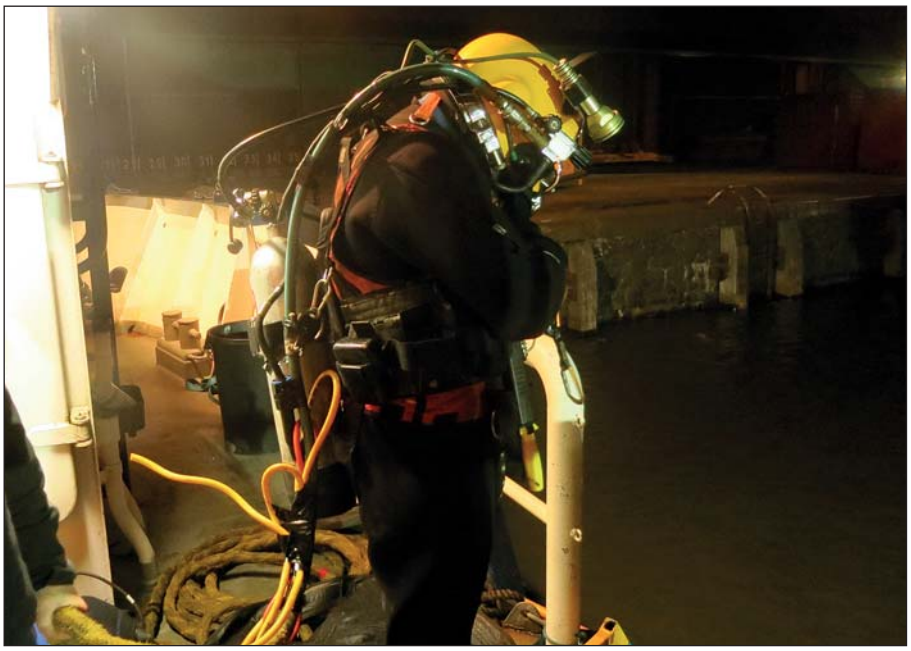
Underwater rudder repair in Rotterdam

A Hydrex diving team mobilized to a 170-meter container vessel with one of our workboats. The team installed a doubler plate over the cavitated area of the rudder during the ship's scheduled maintenance stop in Rotterdam.

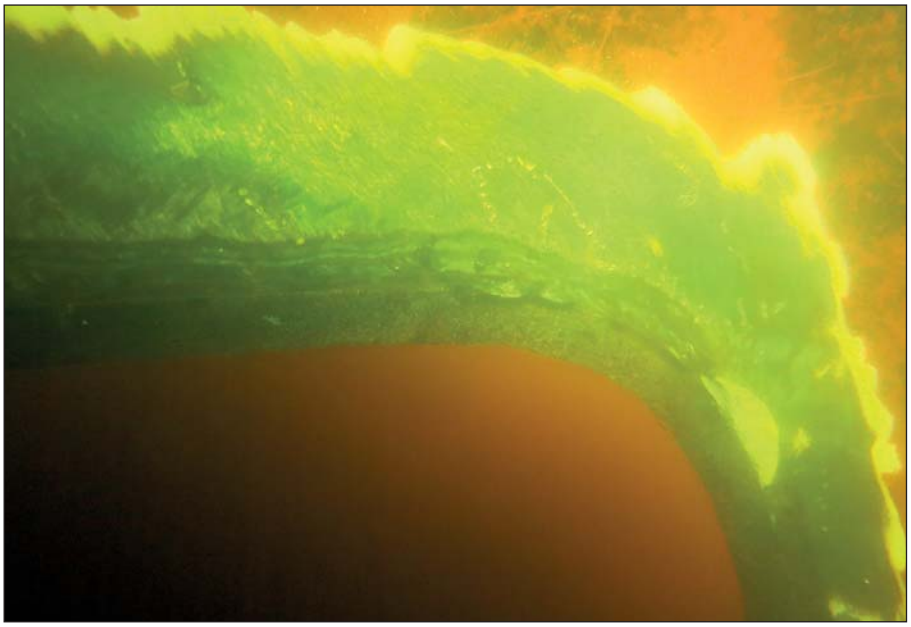
An earlier inspection carried out in Algeciras had revealed the damage to the rudder. A condition of class was imposed on the vessel and a custom solution was needed. We proposed a repair plan to the class that would allow the vessel to keep sailing until the next scheduled docking.

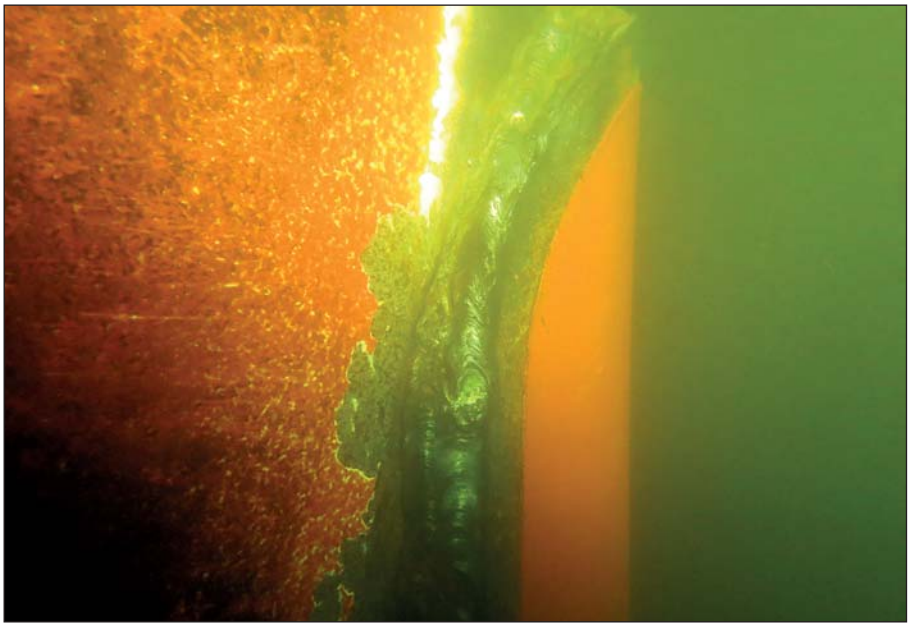
Hydrex team members on workboat discussing the operation.

Deployment to the vessel was done using a Hydrex workboat loaded with all the needed equipment. After our team arrived on-site, they performed an underwater inspection of the leading edge of the rudder, where the damage was situated. The divers then started preparing the affected area for the installation of the doubler plate. The plate had been prepared in advance. This was



Diver getting ready during night shift.





Doubler plate secured by certified Hydrex welders.

done with the information of the preliminary inspection in Algeciras combined with the drawings of the rudder, provided by the owner.

When the rudder had been prepared our certified diver/welders fitted the plate and secured it. The team then installed anodes on both sides of the rudder for further protection. This concluded the repair.

During the operation a representative of the classification society was present. He gave his approval for the repair. The owner can now sail his ship until the next scheduled dry-docking without having to worry about further unscheduled delays or repairs to its rudder.

Conclusion

Performing jobs like these on a tight schedule takes a lot of planning. This can only be done successfully by staff who have familiarity with such operations and the relevant know-how and equipment. We have a technical department capable of executing all the required planning. Our diver/technicians are trained and qualified to perform the full range of required class-approved repair procedures in even the harshest conditions. Hydrex also has very well-equipped rapid response centers including customized workboats, ready to mobilize directly to the job site. An effective, competent team is the only way to consistently achieve a high quality result in the short periods of time usually available to ships. ■

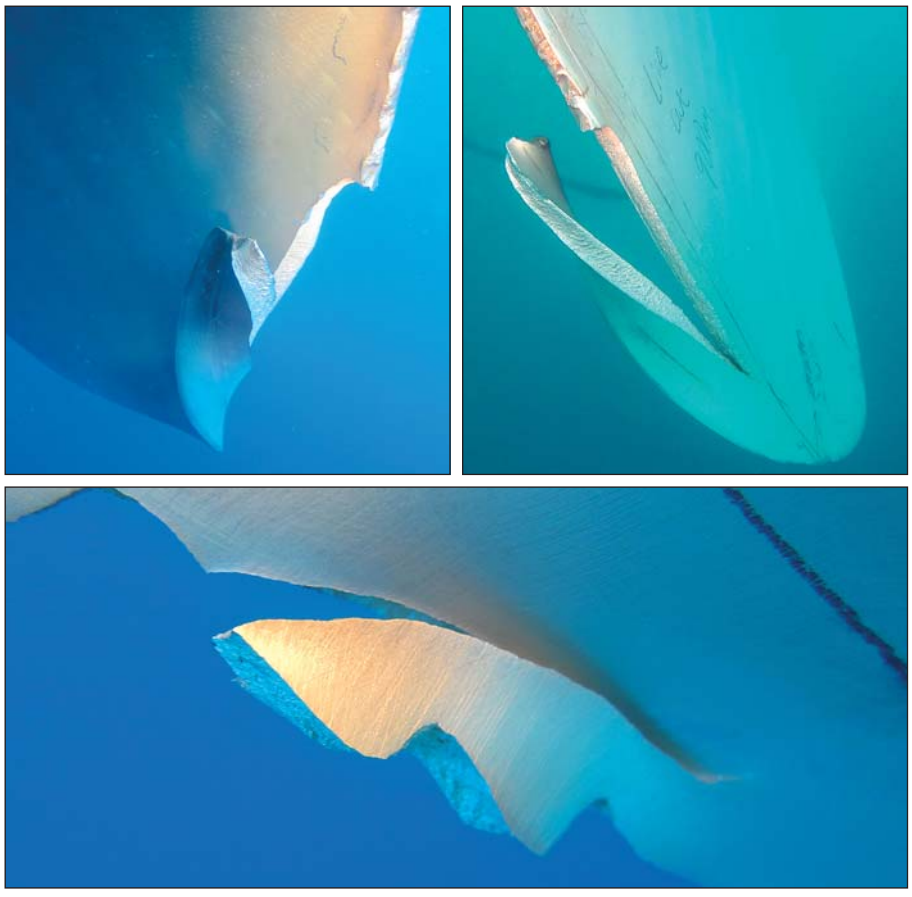
KEEPING SHIPS IN BUSINESS

Fast repairs in Spain and France put a spin on propeller cropping

Teams of Hydrex diver/technicians performed propeller blade repairs on bulkcarriers 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.

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 us to straighten damaged blades in-water, allowing commercial operations to continue.

One of the bent blades of the bulker in Dunkirk.



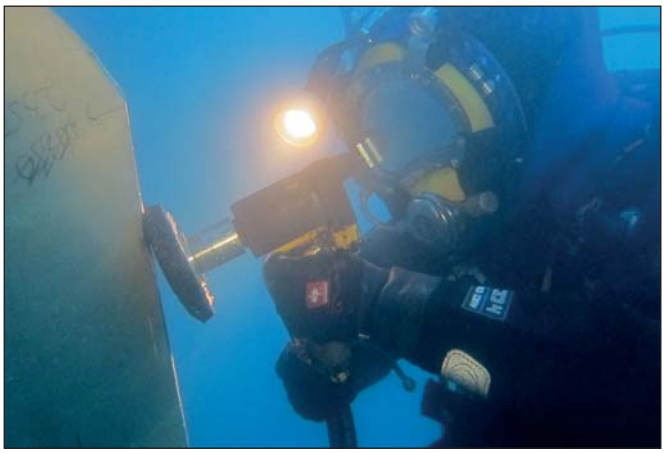
Damaged leading edges of the blades of the vessel in Algeciras.

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.

Underwater blade cropping in Dunkirk

The four blades of a 229-meter bulkcarrier'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 modify the damaged blades.

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.

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 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.

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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 to bring the propeller's workload back to its original level and optimize its performance.

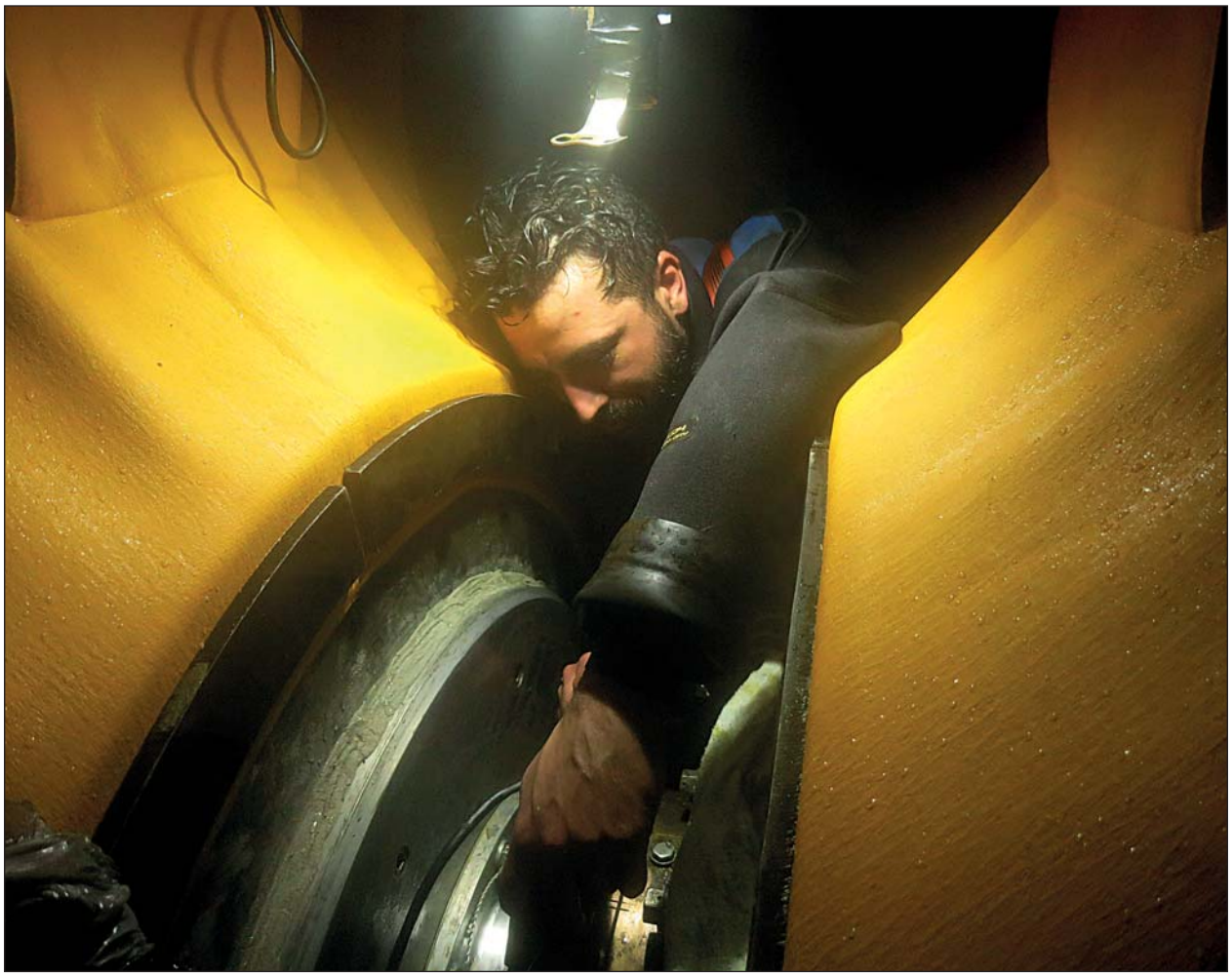
The repair was carried out by a Hydrex diver/technician team mobilized from the close-by office in Algeciras following the same procedure as the operation in Dunkirk.

Conclusion

Both bulkcarriers could continue their schedule without going offhire 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. ■

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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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 Rotterdam, 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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