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KEEPING SHIPS IN BUSINESS

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Underwater services and
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In-water bow thruster repairs



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.

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Permanent and temporary underwater rudder repairs

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.

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

Emergency afloat rudder operation in Le Havre

The rudder of a 250-meter crude oil tanker started showing wrong readings. An inspection uncovered that the rudder was not aligned correctly anymore and that its movements did not match the readings. The ship was unable to sail any further and an on-site solution was needed. One of our diver/technician teams therefore mobilized to Le Havre, France to



After the securing plates were installed, the ship could be towed safely.

perform an emergency repair operation.

After arriving at the vessel's location the divers performed a detailed inspection of the rudder. This revealed that the rudder pintle needed to be removed to perform a permanent repair. The stormy weather conditions in Le Havre could cause the rudder to move, which would make

it impossible to reinstall the pintle in-situ. For this reason it was decided that the ship needed to be towed to the nearest available drydock, in Brest for permanent repairs. This changed the scope of the work completely. Because our teams are trained to handle challenging and constantly changing circumstances, they adapted to the new task without any problem or delay. We proposed to



Hydrex certified welders securing the brackets.



Hydrex under-water 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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secure the rudder so that the vessel could be towed safely.

The team pulled the rudder to a zero angle. They also took the exact measurements needed to fabricate four securing plates that would fully lock the rudder in the neutral position. Once the plates were delivered, they were modified by the team to the correct size. Next they installed the stiffeners on both sides of the rudder. This would prevent the rudder from moving and causing further damage while the ship was towed.

Upon completion of the operation the attending surveyor, together with the superintendent and captain, inspected and approved the repairs. Thanks to our team the ship could be towed safely to Brest for permanent repairs.

Wet welding repairs of rudder cracks

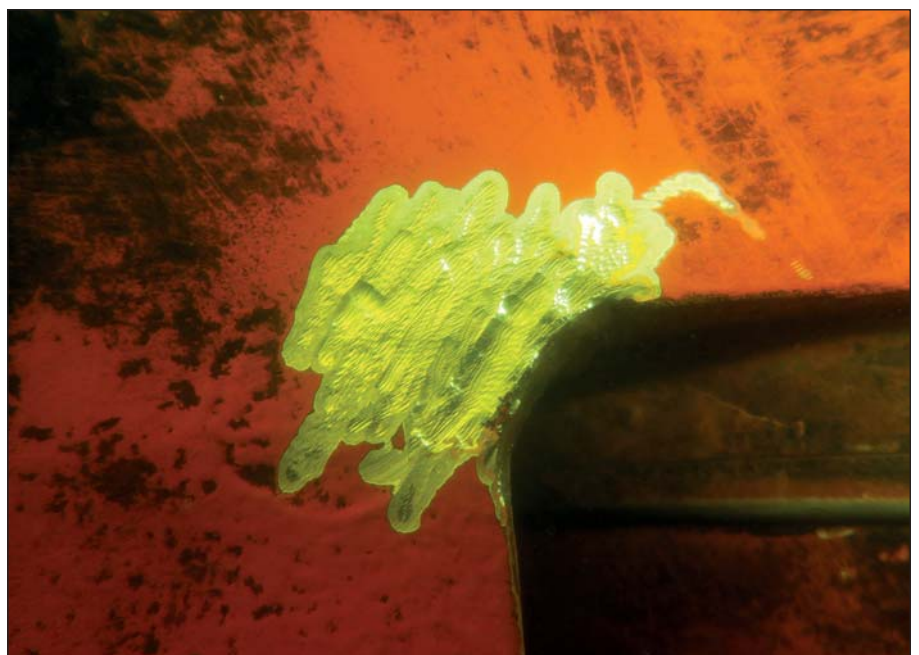
A 228-meter vehicle carrier had several cracks along the hinges connecting the rudder flap to the main rudder blade. Fortunately most of those could be repaired by grind-

ing them away and filling the area with clad welding.

Three of the cracks were too big and needed a different approach. Our diver/welders first drilled arrests on all sides of these cracks to prevent them from spreading. They then positioned a C-shaped plate over each of the cracks and secured it with wet welding.

This allowed the owner to sail the vessel without having to worry about the condition of the rudder. He can have a permanent repair carried out during the ship's next scheduled drydock visit at a more convenient time and location.

Luckily the cracks on the rudder were spotted during an underwater inspection before they caused problems for the ship. This once again shows the benefits of having regular inspections carried out by competent divers, followed by comprehensive and accurate reports. Our teams can detect any problem so that they can be corrected early and prevent the more costly repair which neglect and further damage would bring about.



Some of the cracks on the vehicle carrier could be grinded away and filled with clad welding.

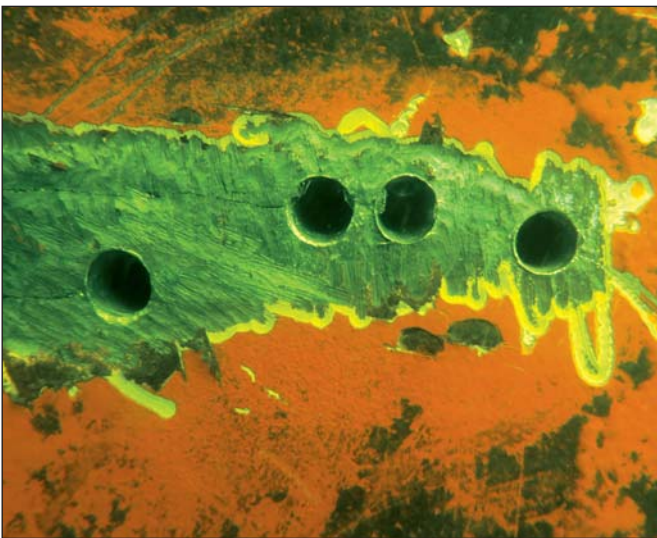
Balanced rudder repair in Antwerp

We were contacted by the owner of a 200-meter vehicle carrier because the rudder of his vessel was not functioning properly. A diver/technician 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.



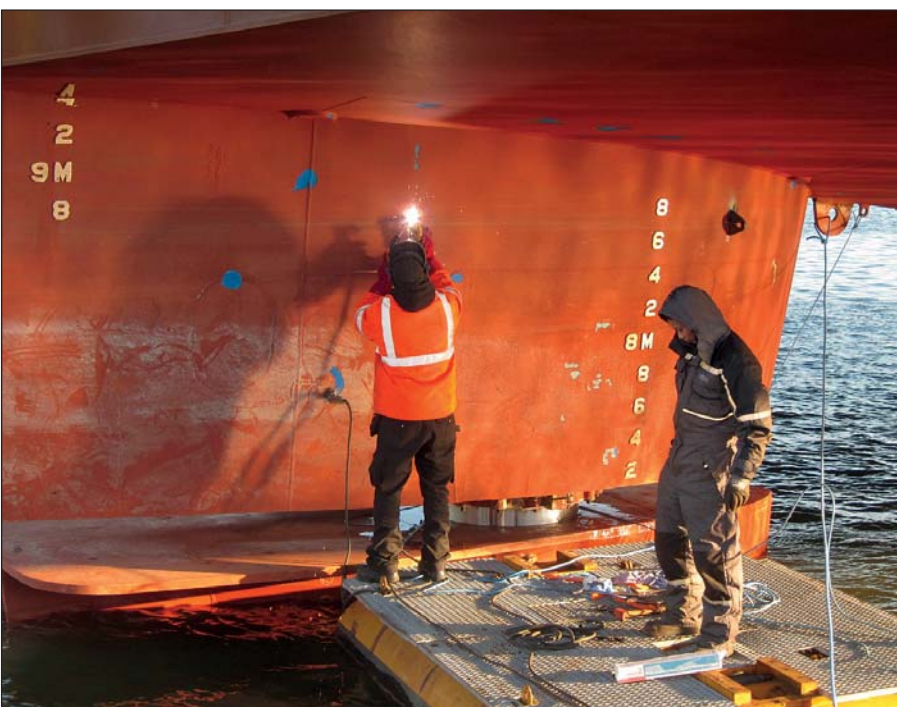
Hydrex team members on our workboat discussing the operation.



Crack arrest were made on all ends of the larger cracks



A C-shaped doubler was installed over each of the three larger cracks in the rudder.



Hydrex team members preparing the rudder.

This revealed several irregularities on the rudder seals.

Our universal rudder repair mob-dock 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.

This 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.

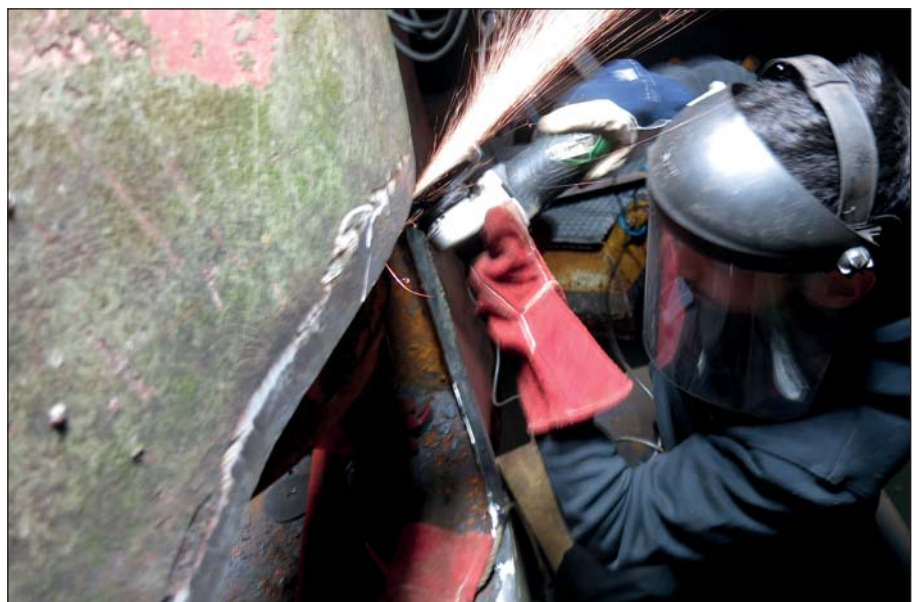
Rudder cover crack repair in Rotterdam

An underwater inspection revealed cracks in the welding seams of both rudder cover plates of a 144-meter tanker. To prevent the pintle nut from corroding, the classification society demanded that the owner had the damage repaired as soon as possible. When the tanker was on its way to Rotterdam we were contacted to find an on-site solution that would prevent an unscheduled and unwelcome trip to drydock.

The classification society had given the owner a very strict deadline. It



A dye check revealed the extend of the cracks.



Beveling the edge of the rudder plate to fit the new cover plate.



Hydrex equipment next to tanker in Rotterdam.

was therefore essential that our technical department came up with a repair plan that could be carried out very quickly. A diver/technician team immediately mobilized to the vessel's destination so they could start the operation as soon as the ship arrived in Rotterdam.

Because the tanker was empty, the rudder could be trimmed enough to allow a repair above water. The team first carried out a detailed inspection of the rudder cover plates. This enabled them to make a full assessment of the damage and communicate the information with our technical department. A dye check of the



Fully welded new cover plate.

cracks quickly revealed that the damage of the cover plate welding seams was of such extent that replacing both plates in their entirety was the best option.

The team removed the plates and beveled the edges of the rudder plate to fit the new inserts. In the mean-time two new plates were arranged by our technical department. They needed to be the right shape to fit the curve of the rudder perfectly. They were collected from the supplier and cut to the right size in our fast response center where a large stock of equipment is available for emergency repairs as this.

The plates were then transported to the vessel. The diver/technicians fit them in the rudder plate and secured them with a full penetration weld. Ultrasonic and magnetic particles tests were successfully carried out by an independent inspector, finalizing the repair. Seven bolt-on anodes were also installed on each side of the rudder.

The entire operation was supervised and approved by a surveyor of the classification society and the condition of class was lifted. Our team



Hydrex diver/technician getting dressed for underwater rudder operation.

worked in shifts the finish the repair in the shortest possible time. When they left the tanker, the satisfied owner could sail his vessel again without having to worry about costly off-hire time.

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. ■

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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In-water 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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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.

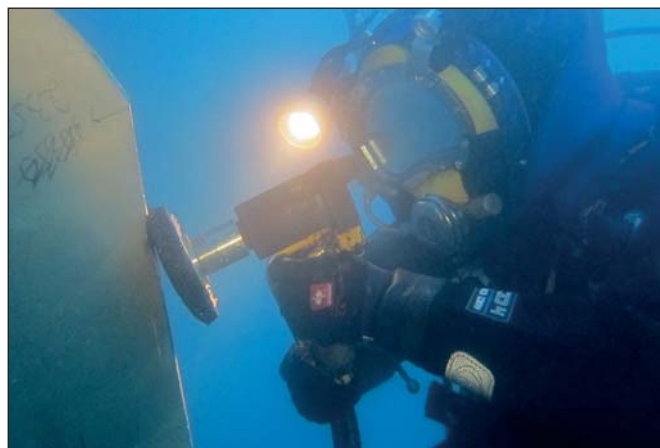
In the following examples cropping was the only option as the damage to the propeller blades was too great to allow cold straightening. This kind of repair is carried out with the propeller blade cutting equipment developed by the Hydrex research department. In cases where there is an even number of 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 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 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.



Hydrex technician measuring a cropped piece of propeller blade.

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.

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 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. ■

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Underwater scrubber sea chest installation



Our wide range of maintenance and repair services includes the installation of additional sea chests required for the intakes and outlets of scrubber systems. These afloat installations are performed by installing a cofferdam on the hull.

We can help you when going to dry-dock is not an option, if the scrubber equipment is not available yet during docking or if the scrubber system needs to be installed before the next scheduled docking. We are able to carry out the installation of sea chests while your vessel stays

afloat and in most cases during cargo operations.

If you would like to discuss this possibility of in-water scrubber system installation, please contact us at +32 3 213 53 00 or hydrex@hydrex.be



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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 dry-dock.

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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