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ISO 9001 certified

Underwater services and
technology approved by:



**BUREAU
VERITAS**



ClassNK



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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Underwater thruster repairs adapted to your vessel's schedule

Hydrex diver/technicians can perform a wide range of repair or maintenance work on all types of thrusters. An entire unit can be overhauled, propeller blades and seals can be replaced or repair work on another specific part of a thruster can be performed on-site or inside the tunnel. These repairs are performed in cooperation with OEMs. They can be carried out while the vessel stays afloat with minimum impact on its schedule.

Tunnel thruster operations specifically are carried out using our flexible mobdocks that close off the thruster tunnel on both sides. This allows divers to work in a dry environment around the unit. The lightweight mobdocks can quickly be transported to any location around the world. All operations



Hydrex certified welder reinstalling the rope guard of portside thruster.

can be carried out in port during cargo operations or at anchorage. An animation of the procedure used can be viewed on the special thruster

repair page of our website or can be requested by contacting one of our offices.

The size of the thruster does not matter. Hydrex flexible mobdocks can be easily adapted to the circumstance. They can be used for a wide range of repair or maintenance work on all types and sizes of thrusters and vessels.

Despite the scope of some these operations, bow thruster removals can be performed very fast. The removal of the unit can be done in the wet, because it has to be overhauled. We only need to remove the blades and close the unit off with flanges. The reinstallation needs to be done in the dry because the blades need to be reinstalled without water ingress.



Removal of the thruster blade to replace the blade seal.



Permanent in-water rudder repairs now possible without drydocking



Hydrex has developed an entirely new method enabling permanent repairs of rudders without drydocking the ship. Permanent repairs were hitherto not possible and ships had to drydock in case a major defect was found. The newly designed equipment is light-weight and can be mobilized very rapidly in our special flight containers. Therefore this new service is now available world-wide.

Major defects on rudders very often cause unscheduled drydocking of ships. The new method designed by our technical department allows engineers, welders and inspectors to perform their tasks in dry conditions. Class approved permanent repairs on-site, without moving the ship, are now possible and commercial operations can continue. Steel repairs and replacements can be performed and pintle and bushing defects can be solved without the loss of time and money associated with drydocking.

The equipment can be mobilized within hours to any port in the world and is available for rapid mobilization from the Hydrex headquarters in Antwerp.

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Portside azimuth thruster being lowered into the water again after the repairs.

In most cases a thruster overhaul is planned in during a scheduled drydocking. This usually means that the unit is removed in drydock. The ship then has to wait for the overhauled thruster to return and be reinstalled before the vessel can leave drydock. This results in a longer drydock time and consequent cost. Hydrex can however remove the unit while the ship is still afloat so it can already be brought to the manu-

facturer for the overhaul. When the vessel enters drydock the overhauled unit is ready for reinstallation without any delay.

The reverse procedure is also possible. If the thruster is removed in drydock, Hydrex can reinstall it underwater in dry conditions at a later date. In this way the ship can already leave drydock while the unit is still with the manufacturer.



Hydrex diver/technician preparing to dismantle the gearbox.

Our goal is to offer you the most efficient solution while maintaining the highest safety and quality standards. This article gives an overview of some of the more important recent thruster repairs carried out by Hydrex.

Simultaneous underwater repairs on two offshore vessels in Mexico

Last year a team of experienced Hydrex diver/technicians performed underwater thruster operations on two vessels simultaneously in Coatzacoalcos, Mexico. Repairs were carried out on both azimuth thrusters of an FPSO while the thruster seals of a heavy load carrier were replaced.

Both vessels are managed by the same company. They were suffering from leakage problems on their propulsion system. We received these inquiries and were able to combine both repairs in one operation. This gave our customer the advantage of only one mobilization for both vessels and kept the cost within budget.

The stern thruster tunnel of the heavy load carrier was sealed off with our flexible mobdocks. All water was then emptied from the tunnel, creating a dry workspace around the thruster unit. A full inspection of the unit revealed that all blade and shaft seals were leaking. Our diver/technicians first replaced the four blade seals. The three shaft seals were then replaced in cooperation with the representative of the OEM.

The other vessel was an FPSO which had suffered a problem in the oil distribution box of one azimuth thruster. A special cofferdam was designed by the Hydrex R&D

department to create a dry environment around this part of the thruster. This enabled our team to perform a complete repair without removing the thruster. The other azimuth thruster had more serious problems and a complete removal was required. As the thruster was not designed to be removed underwater, we created a custom procedure for this.

Flexibility is an important element of every job we carry out, but in this case it was crucial that both repairs were adjusted to each other. Because we were able to fulfill the needs of our customer he could keep the vessels out of drydock and on contract.

Fast response keeps vessel on project in Australia

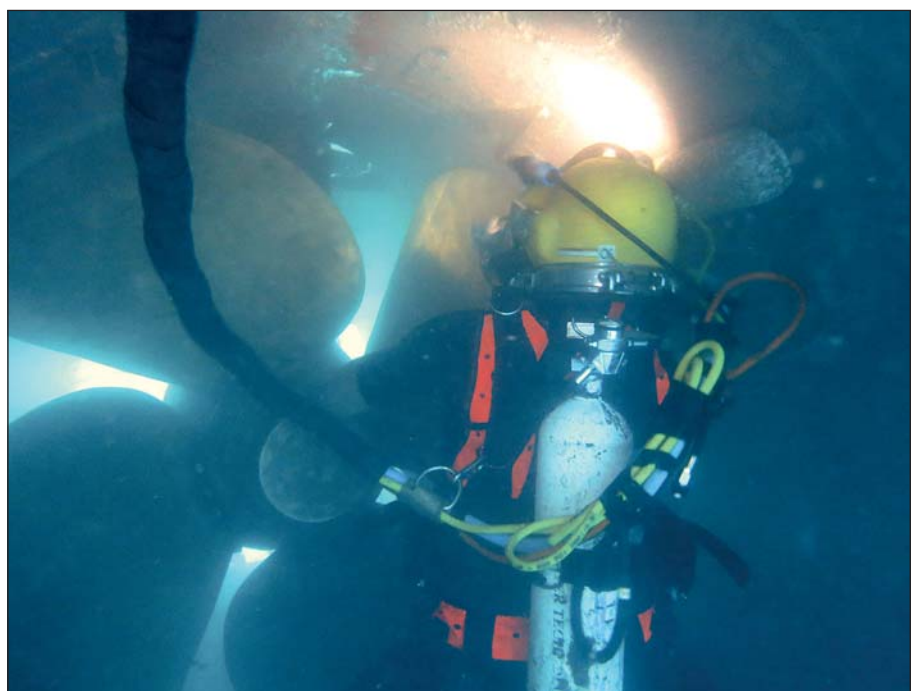
We removed the bow thruster of a large offshore supply vessel and reinstalled the unit after it was overhauled. By carrying out both parts of the operation underwater while the vessel was at anchorage in Dampier, Australia, the ship did not have to go

to drydock and could stay on the project.

Despite the remote location of the vessel, our technical department was able to make all logistic arrangements and organize a mobilization of the equipment swiftly. Recently we have carried out several operations in Australia, all of which were done with a limited window of opportunity available.

After our divers removed the bow thruster unit it was brought to a local workshop where it was overhauled by a technician team of the OEM. The Hydrex team remained on stand-by so that they could immediately start the dry reinstallation when the bow thruster arrived back on location.

During the entire operation there was a close cooperation with the OEM so that the different parts of the repair were perfectly coordinated. This allowed us to offer the best possible solution to our customer within the shortest possible timeframe.



Hydrex diver performing final inspection of reinstalled thruster blades in Australia.

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.

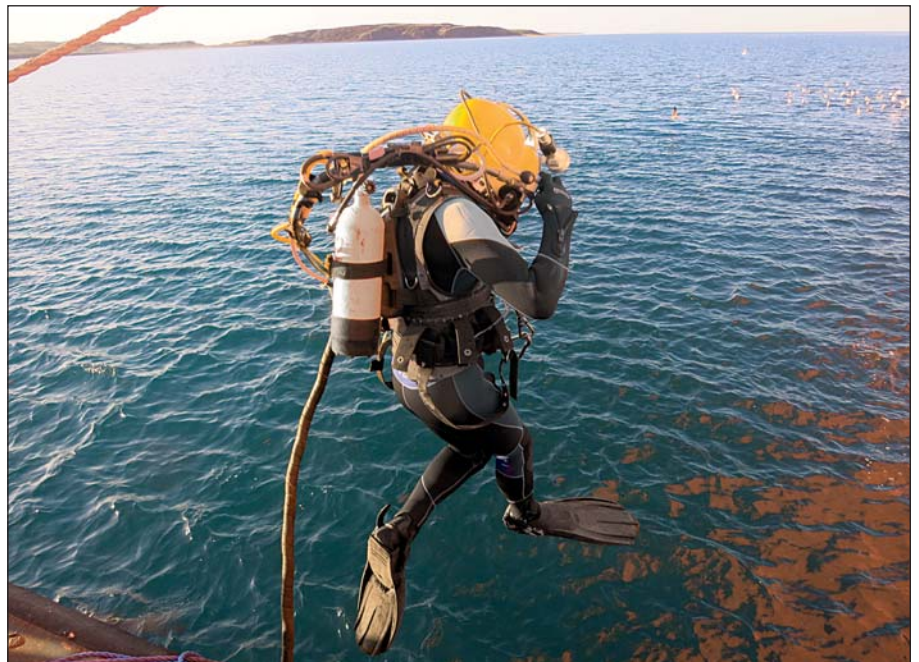
With fuel costs amounting to 40% of operational expenses and continuing to rise, reducing fuel consumption is a vital concern of ship owners. This is the reason why hull monitoring pays for itself. Underwater hull roughness, marine fouling, bent propellers and poor paint condition are all factors that 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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Diver performing welding work on the hull of offshore supply vessel in Australia.



Hydrex diver taking the plunge.

Hydrex enables OEM to access bow thruster out of drydock

When a 162-meter pipe laying vessel suffered an oil leak, going to drydock for bow thruster repairs seemed the only option. The owner contacted us to see if we could develop an underwater solution that would allow the OEM specialists to access the thruster tunnel while the vessel was still afloat. This would avoid off-hire for the vessel.

One of our technicians met up in Mobile, Alabama, with the owner and representatives of the OEM to discuss the repair plan devised by the Hydrex technical department. This proposal included the installation of two open top cofferdams to close off the thruster tunnel.

The operation required Hydrex to think and handle fast to allow the owner to keep his ship on project. The schedule of the pipe laying vessel offered only a window of two



Final touches being made to the cofferdams in Alabama.



Open top cofferdam with all water emptied from it.



Hydrex technician working on the rigging points in the thruster tunnel.



Installing the propeller on the assembly.

weeks to develop an underwater solution and two further weeks to carry out the operation, including the building of both cofferdams.

Underwater bow thruster removal adapted to the ship's schedule

A month after a Hydrex diver/technician team removed a bow thruster unit which needed to be overhauled from a 360-meter container vessel, the same procedure was repeated on the vessel's sister ship. As with the earlier operation, the team first prepared the thruster tunnel during the ship's stop in Le Havre, France before carrying out the removal itself in Rotterdam.

The available window in Rotterdam was very short for both vessels. The time required to remove the thruster unit therefore needed to be brought back to the absolute minimum. Splitting the job into two steps allowed our divers to perform these operations underwater and in a very short time frame without interrupting the vessels' schedule. Both operations were carried out using one of the Hydrex workboats which are fully equipped as dive support stations and can be used for a wide range of operations. They increase





Bow thruster unit on Hydrex workboat in Rotterdam.

flexibility of operation, which is essential during operations like these.

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. Hydrex has 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 harsh-

est 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. ■

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One of the Hydrex workboats was used to transport the unit to the manufacturer.

Underwater propeller cone fin installation offers immediate fuel saving

Over the last few months Hydrex installed propeller cone fins on several general cargo and container vessels. We can carry out these operations all over the world.

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

Propeller caps like these 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. Hydrex can install propeller cone fins underwater on any size and make of propeller, on both new build or in-service vessels.

Installation afloat prevents a long wait for fuel savings

We carry out these operations following the specific procedures required by the involved OEM, adapted for an underwater installation.

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



Preparing a propeller cone fin for installation.

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



Hydrex workboat next to container vessel during propeller cone fin installation.

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 as well as maintenance services are done while the vessel is afloat. This eliminates the need to drydock.

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

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Removing the old propeller cap.



Lowering the new propeller cone fin into the water.



Propeller cone fin brought into position.

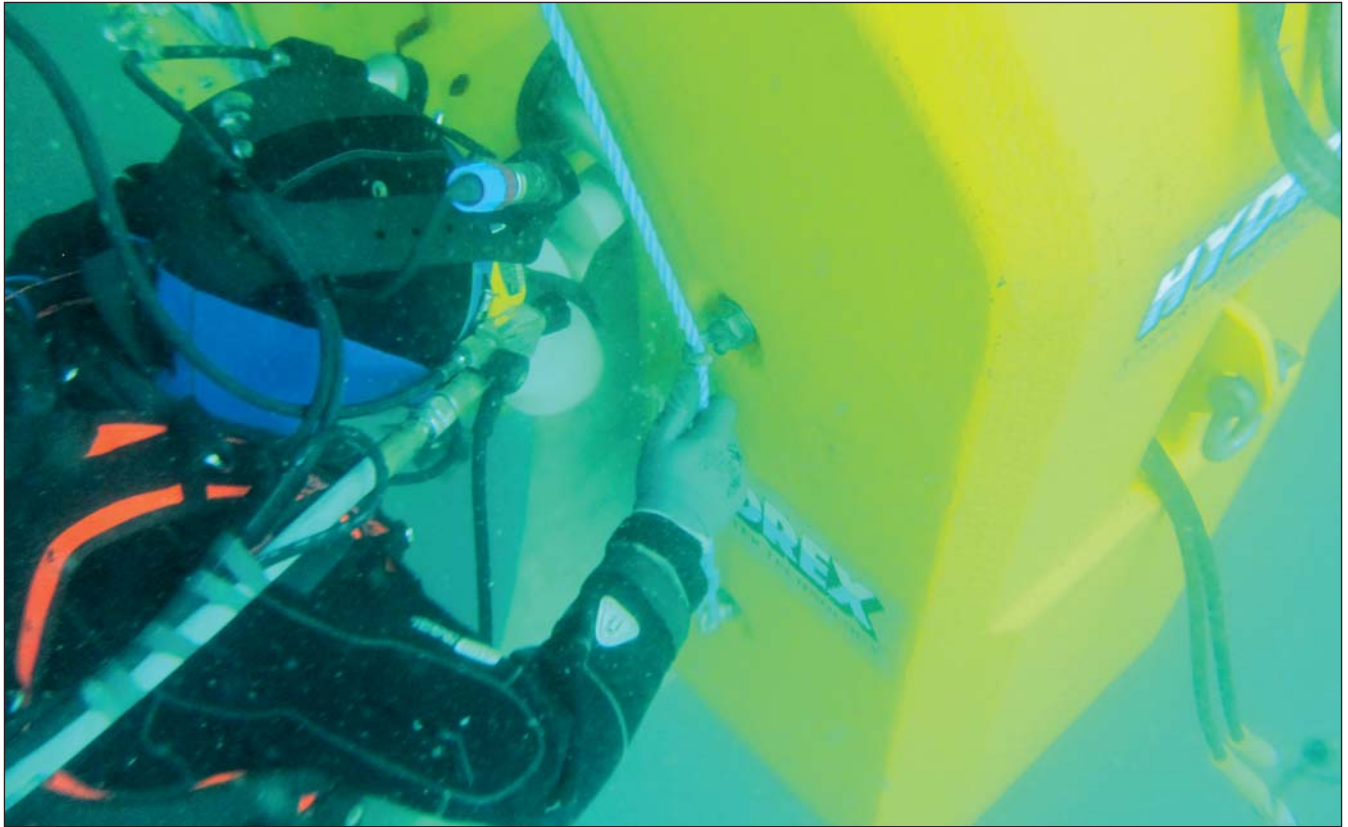
win him up to four years of fuel savings. In contrast, he will have earned back the cost of the under-

water installation in only a few months. The savings are considerable. ■



Hydrex vans and equipment next to general cargo vessel.

Fast underwater propeller blade straightening



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 tech-

nique 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.

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Keeping ships in business

Hydrex offers turnkey underwater repair solutions to ship-owners wherever and whenever they are needed. Hydrex's multi-disciplinary 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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