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KEEPING SHIPS IN BUSINESS

ISO 9001 certified

Underwater services and
technology approved by:



Permanent 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 dry-docking 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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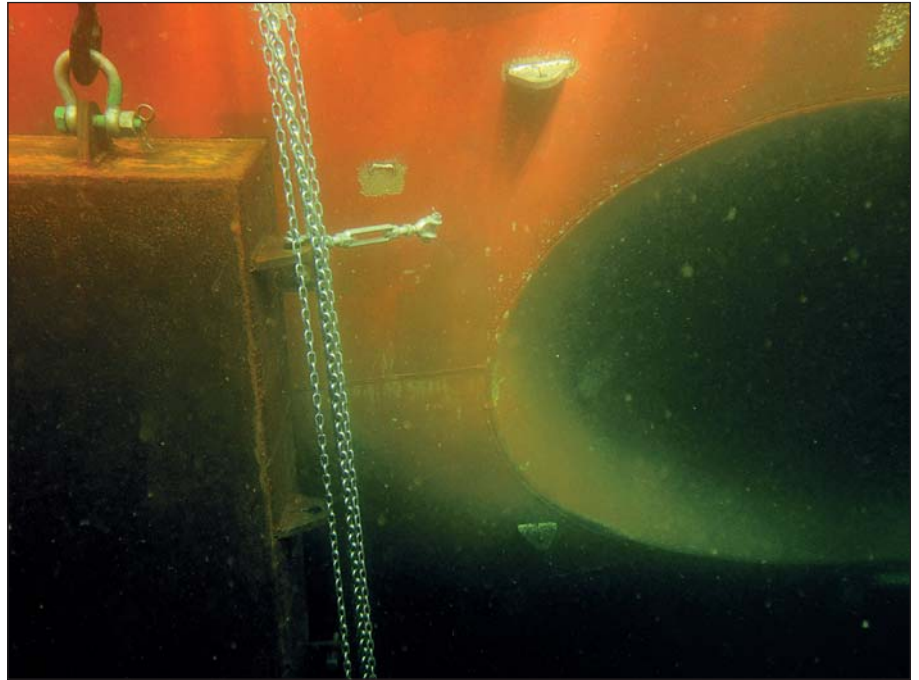
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Fast underwater bow thruster repairs keep ships out of drydock

Hydrex can assist shipowners with almost any problem they encounter with their vessel's thruster. A wide range of repair or maintenance work can be carried out on all types of thrusters. An entire unit can be overhauled, propeller blades or seals can be replaced or repair work on a specific part of a thruster can be performed by Hydrex diver/technicians on-site. All of these repairs can be carried out without the need to drydock the vessel.

Hydrex was the first company to show that it was possible to remove and then replace thrusters by creating a dry environment underwater. Using the Hydrex-developed steel mobdocks to seal off the thruster tunnel, with an access shaft protruding above the water, work teams



In Gabon the cofferdams were used to close off the thruster tunnel on both sides.

accessed the thruster tunnel and removed or repaired the thruster within the tunnel in complete safety.

This was done in conditions similar to those above water.

Hydrex has since then developed this technology further using lightweight flexible mobdocks. These modernized mobdocks, which are designed to be easily transported around the world, are used to close off the thruster tunnel on both sides. This allows divers to work in a dry environment around the unit.

Hydrex has also developed a permanent thruster repair and replacement system. This system has been developed so it can be tailored to most vessels. It can be included in the planning for a newbuild, installed on a unit going to drydock or constructed and brought onboard at any other



One of the cofferdams had an open top to give the Hydrex technicians access to the thruster tunnel.



suitable time. With such a system on standby, any repair work to the thruster that may arise can be dealt with much faster and more easily.

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.

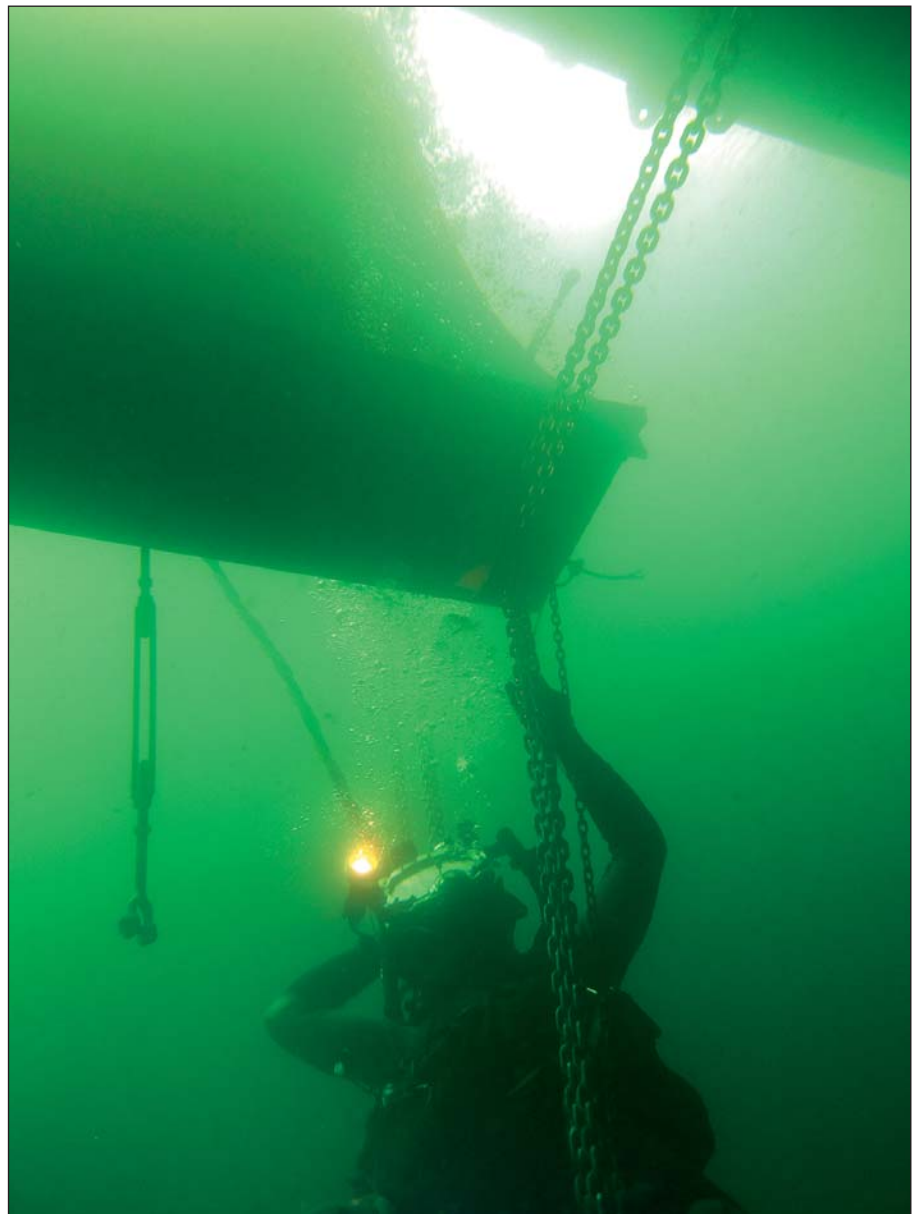
This article gives an overview of some of the more important recent bow thruster repairs carried out by Hydrex.

Fast bow thruster operation in Congo and Gabon avoids drydocking

Recently an 86-meter research vessel needed the stainless steel belt in one of its thruster tunnels replaced. A Hydrex diver/technician team therefore flew to Pointe-Noire, Congo to perform the repairs.

The stainless steel belt is installed around the perimeter of a thruster tunnel at the location of the thruster blades. There the impact of the cavitation caused by the movement of the blades is the most severe. Extra protection against cavitation damage is therefore essential. When the stainless steel belt in the thruster tunnel of the research vessel suffered cracks, the underlying steel was exposed to cavitation. The belt needed to be replaced as soon as possible to prevent the thruster tunnel from getting damaged too severely. The owner of the vessel would have had to take his vessel to drydock if no on-site solution was found.

A tailor-made open-top cofferdam was designed by the Hydrex technical department. It was constructed in a local workshop in Pointe-Noire



Hydrex diver/technician guiding the cofferdam underwater.



Hydrex technicians securing the new stainless steel belt.

under the supervision of Hydrex diver/technicians. At the same time a regular shaped second cofferdam was also built.

Infrastructure and dredging work in the port of Pointe-Noire brought the visibility down to almost zero. The safety of the divers could not be guaranteed. For this reason Hydrex proposed a new location for the operation.

The owner gladly accepted the proposal to move the research vessel to Port Gentil, Gabon. Thanks to the sheltered environment of the bay the swell is limited. This makes it an excellent location to carry out repair or maintenance work on a ship, barge or rig and this in ideal conditions.

After a short trip the ship arrived in Port Gentil with the Hydrex team and all the equipment on board. A diving station was set up and the diver/technicians started the installation of the cofferdams. Next they emptied all water from the thruster tunnel, descended into it and carried out the repair. The old damaged belt was removed and replaced with a new stainless steel belt.

The actual operation was finished in only five days. The team removed the cofferdams and the ship was ready to continue its schedule with

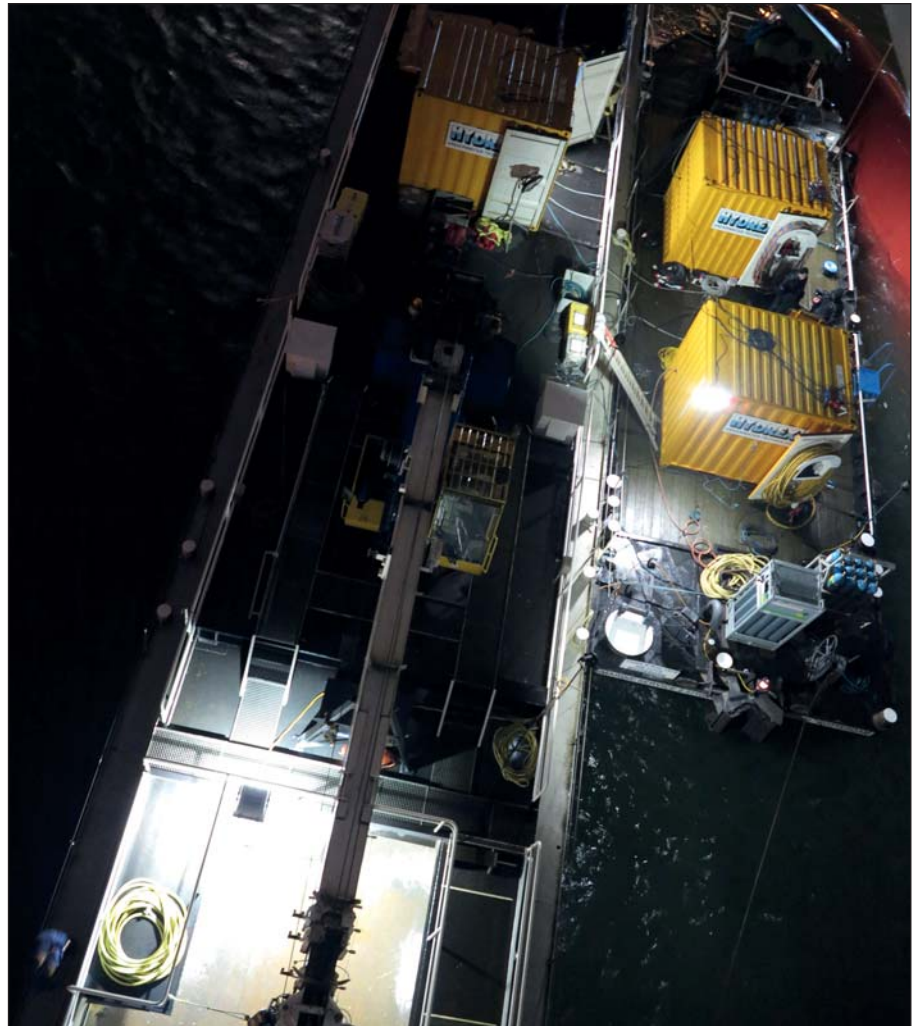
its thruster tunnel fully protected against cavitation once more.

Fast underwater bow thruster blade replacement in Rotterdam during commercial activities

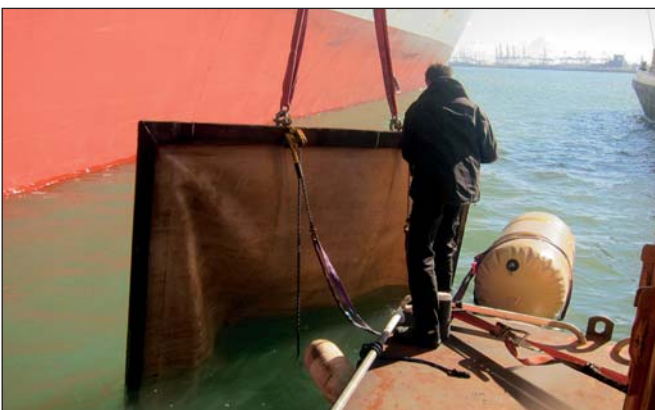
Hydrex carried out bow thruster blade replacements on three 366-

meter container ships belonging to the same owner. The vessels were given the same speedy treatment during unloading in Rotterdam,

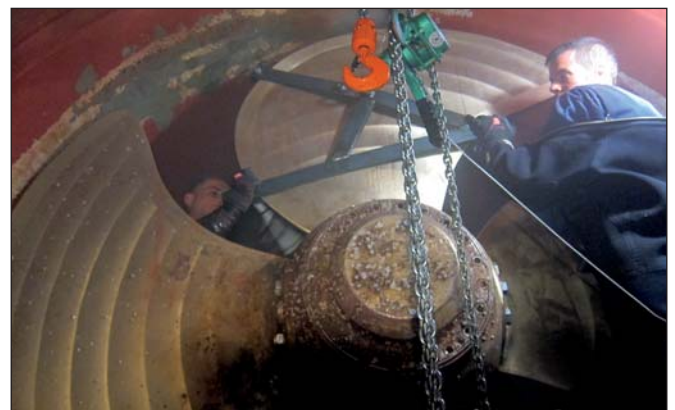
The owner of the ships had the luxury of being able to schedule the blade replacements well in advance. This allowed the Hydrex technical department to get a team on the road



Hydrex equipment on workboats next to container vessel in Rotterdam.



Hydrex flexible mobdock lowered into the water.



Positioning one of the new thruster blades.

Fast underwater ship hull repairs save time and money



Hydrex on-site hull repair services include the renewal of both small and large areas of damaged hull plating. These repairs can be carried out above or below water, according to the circumstances, with tailor-made mobdocks. Normal commercial activities can therefore continue without disruption. These operations follow the Hydrex procedure for welding cracks in the vessel's shell plating and they are approved by the major classification societies.

Hydrex diver/technician teams carry out these on-site hull repairs all over the world. In most cases the damaged area can be replaced with a permanent insert and no condition of class is imposed. On the rare occasions where the damage does not allow such a repair, a temporary doubler plate is installed over the affected area. This allows the owners to keep to their schedule and have a permanent repair carried out during the next scheduled drydock visit.

To offer the fastest possible service to customers, Hydrex offices have fast response centers where an extensive range of state-of-the-art tools and diving support equipment is available at all times for the repair teams.



before the vessel arrived. As a consequence, the diver/technicians were ready to start the operation as soon as the ship was berthed.

The same procedure was used during each of the operations. The new blades were lowered from the deck onto the workboat with the ship's crane. Meanwhile the rest of the Hydrex team prepared the bow thruster tunnel for the operation.

The Hydrex flexible mobdocks were then installed on both sides of the thruster tunnel. Next the team could remove all water from the tunnel. In this manner a dry working environment was created. The diver/technicians then removed the first blade of the bow thruster and brought it to the surface. A replacement blade was then lowered into the water and taken to the thruster tunnel. The team positioned the new blade on the bow thruster and secured it with bolts. This procedure was repeated for the other blades.

During each of the replacements a local representative of the bow thruster manufacturer was present. He supervised the operations and gave his approval.

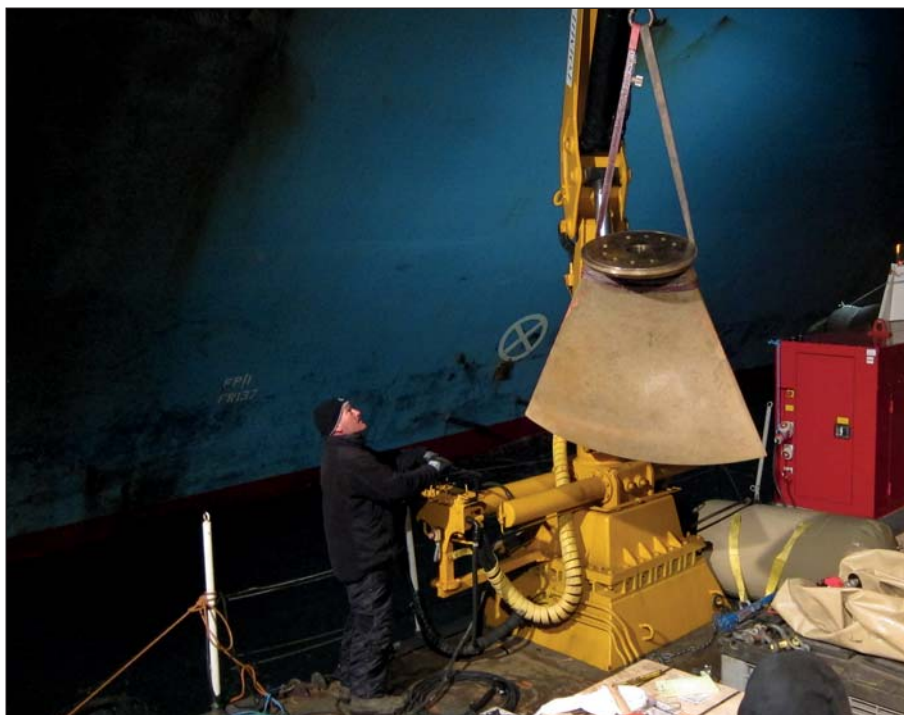
Underwater bow thruster removal using Hydrex workboats

Also in Rotterdam, a Hydrex diver/technician team removed the bow thruster of a 300-meter container vessel. The unit needed to be overhauled. Hydrex performed the operation underwater using its own workboats based at the Antwerp depot. This made it possible for the owner to keep his vessel out of drydock.

The team mobilized from the Hydrex headquarters in Antwerp after all basic preparations had been made and the needed equipment was loaded onto one of the Hydrex workboats. The Hydrex catamarans are fully equipped as dive support stations with hydraulic cranes, winches, nautical and communication equipment and a dive control room. They can be used for a wide range of operations in Belgium, the Netherlands, the United Kingdom and France, permitting even more rapid deployment from the Antwerp depot. This increases flexibility of operations and helps to keep costs down for the client.



Fully loaded Hydrex dive support workboat on its way to Rotterdam.



First the bow thruster blades were detached and brought to the surface.



Bow thruster unit brought onboard the Hydrex workboat.

After they arrived in Rotterdam, the divers installed flexible mobdocks on both sides of the thruster tunnel and emptied all water from the tunnel. This created a dry working area around the bow thruster unit. The team could then detach the bow thruster blades one by one. Next the diver/technicians removed the flexible mobdocks again, concluding the first part of the operation.

The following step was to secure the

gearbox with hoisting equipment. The team then disconnected the bow thruster unit from the engine room and lowered it onto a cradle that can be adjusted to the size of the unit.

The bow thruster was then brought onboard the Hydrex workboat, ready to be overhauled. Next the team securely sealed off the engine room by positioning a flange over the space connecting the thruster tunnel to the room. This made it pos-

sible for the vessel to sail until the overhauled unit is reinstalled.

With the bow thruster unit on deck, the team sailed back to the Hydrex headquarters. From there the unit was transported to the manufacturer to be overhauled.

Underwater bow thruster reinstallation in Tacoma, U.S.A.

Three months after Hydrex diver/technicians removed the bow thruster of a 294-meter container vessel in Tacoma, a Hydrex team once again mobilized to this location to reinstall the overhauled unit underwater with the use of the Hydrex flexible mobdock.

The superintendent of the ship was very satisfied with the first part of the operation. The job was completed well within the available time frame thanks to good team work of the Hydrex divers, the ship staff and the floating crane operator. For this reason the customer asked Hydrex to take care of the reinstallation as well, which was carried out last month.

Together with all the necessary equipment, the team mobilized from the Hydrex office in Clearwater, Florida to the vessel's location. After they set up a monitoring station on a workboat, the team positioned the bow thruster onto a cradle as described in the previous case. The Hydrex divers could lower the unit into the water and maneuver it inside the thruster tunnel in one operation. The team positioned the bow thruster and secured the unit.



New generation cold straightening equipment

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 technique 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.



Hydrex diver/technicians preparing the bow thruster for reinstallation.



Bow thruster unit being positioned in the thruster tunnel.

The team then used the lightweight flexible mobdocks developed by Hydrex to close off the thruster tunnel on both sides. This allowed the diver/technicians to evacuate all the water from the tunnel and create

a dry working environment around the bow thruster. The thruster propeller blades were then reinstalled one by one. The team completed the operation by reconnecting the thruster unit to the engine room.

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 harshest conditions. Hydrex also has very well-equipped rapid response centers including customized workboats, ready to mobilize directly to the job site.

In cases like these, timing is also of the highest importance. Hydrex team members are trained to carry



Hydrex diver preparing for the underwater operation.

out the approved procedures within a short time frame. The operations described were concluded well before the end of these commercial

activities. This allowed the vessels to leave the port again perfectly on schedule. ■

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 and maintenance serv-



ices are done while the vessel is on-site. This eliminates the need to dry-dock.

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

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No drydocking needed thanks to quick underwater stern tube seal repair in Port Gentil

In August, the stern tube seals of a 67-meter, 2223 grt anchor handling vessel were replaced in Port Gentil by a Hydrex team of diver/technicians. The old seals were damaged and a fast repair was therefore necessary. The team carried out the entire operation on-site and underwater with one of the company's flexible mobdocks. This saved the owner the time and money of an unscheduled trip to drydock.

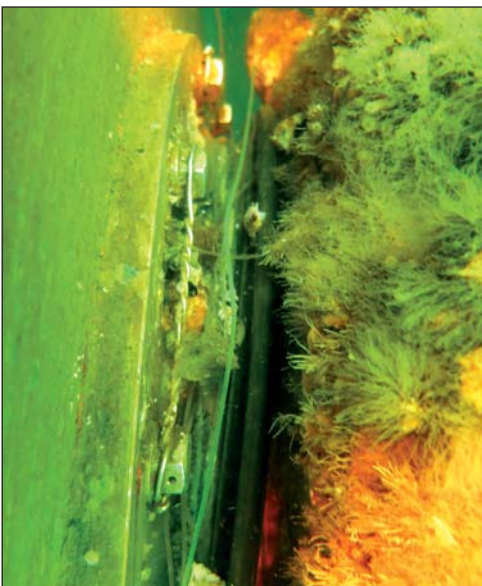
All Hydrex offices have fast response centers. These are equipped with the latest facilities, equipment and tools to increase speed of service. Special flight containers are used to transport the lightweight flexible mobdocks. This allowed for a very fast mobilization and a timely arrival of the Hydrex team in Port Gentil.



A dry environment is created inside the flexible mobdock.

First the diving team set up a monitoring station. Next the actual operation started with a thorough underwater inspection of the stern tube seal assembly. This revealed that a fishing net had become tangled around the assembly.

The team detached the rope guard of the vessel and removed the fishing net from the liner. The divers then set-up the flexible mobdock around the stern tube seal assembly thus creating a dry underwater environment. It allows the divers to perform



A fishing net tangled around the assembly caused the damage.

any necessary work on the assembly in conditions similar to a drydock. This is essential because stern tube

seal repairs cannot be carried out in the wet. Next the team disconnected the split ring and brought it to the

surface. After cleaning the entire assembly, the divers removed the first stern tube seal. A new seal was then installed and bonded. The other three damaged seals were then replaced following the same procedure.

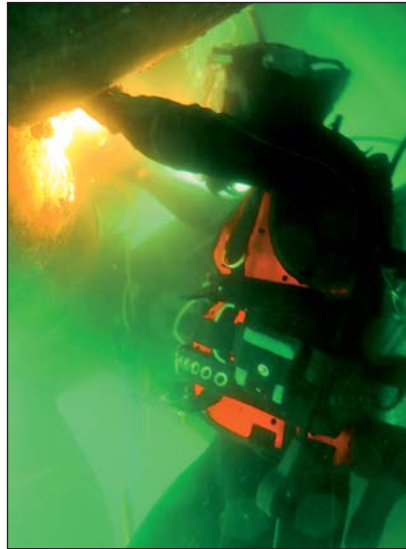
Pressure tests were then carried out with positive results after which the flexible mobdock could be removed and the rope guard reinstalled. This wrapped up the operation.

For almost twenty years Hydrex has carried out repairs and replacements on stern tube seals on-site and underwater. We constantly invest in the research necessary to keep developing new repair techniques and evolving existing procedures. This has made it possible for Hydrex divers to perform permanent repairs to all parts of the underwater ship propulsion system in drydock-like conditions.

For many years our technical department has been dealing with all kinds of circumstances in locations around the world. This enabled our team in Port Gentil to perform the seal repair under the strictest safety regulations, to the highest quality standards and without any delay. ■



Diver/technician preparing the assembly for the operation.



Hydrex diver working on the assembly during stern tube seal operation.



Heavily damaged running area of the stern tube seals.



Diver/technician reinstalling the rope guard.





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 Tampa (U.S.A), Algeciras (Spain), Visakhapatnam (India), and Port Gentil (Gabon).

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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