



## Commercial Ship AFT Seal Oil Discharges

Factual Accounts of Oil Leaking from Propeller Shaft Stern Tubes Due to AFT Seal Damage



Updated: August 16, 2024

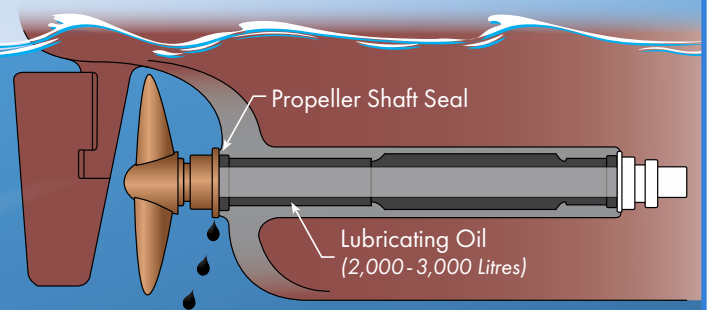
# OIL EMISSIONS FROM PROPULSION SYSTEMS OF COMMERCIAL SHIPS

The sustainability of our oceans is under severe threat. As the shipping industry implements changes to reduce the impact on the seas, eliminating oil emissions from propulsion systems is a viable initiative going hand in hand with the United Nation's Sustainable Development Goal #14: *Life Below Water* as well as the IMO's World Maritime Theme for 2022 *New Technologies for Greener Shipping*. Vessels that operate with a sealed oil lubricated propeller shaft or podded propulsion system routinely leak oil into our oceans and seas and this document offers proof. Many ship owners are acting now and have equipped their ships with alternatives to eliminate oil emissions from propulsion systems forever. When we think about Green Ships, we need a holistic view with considerations below the waterline.



**There are two main types of oil emissions that can occur from stern tubes:**

-  **Operational** oil emissions are the day-to-day oil that leaks from the AFT seal of a stern tube in order for the seal to work properly.
-  **Accidental** emissions happen when there is damage to the seal, like getting tangled in fishing nets.



**Oil emissions from commercial shipping propulsion systems is a serious problem and can be eliminated with the use of open seawater lubricated propeller shaft systems.**



Earlier this year our diver/technician teams carried out a double underwater stern tube seal repair on a RORO ship berthed in Port of Burnie, Tasmania. The ship was leaking oil, making an on-site repair necessary. Using two Hydrex flexible mobdocks simultaneously the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

After arriving on-site, the diving team first set up a monitoring station next to the vessel. The operation then started with a thorough underwater inspection of the stern tube seal assemblies.

After the inspection the divers cleaned the assemblies and installed both flexible mobdocks. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The exact same procedure was followed on both stern tube seal assemblies. The split ring was first disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising OEM technician. The procedure was repeated with the other three seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdocks and the reinstallation of the rope guards.

### **Long distance a stimulus, not a hindrance**

Despite the remote location of the RORO vessel, our technical department was able to make all practical logistic arrangements and organize a mobilization of the equipment very swiftly. In the recent past we have carried out several operations in Australia. On several occasions we mobilized to the same location for an identical job on this ship and its sister vessel, so the customer knew we could perform the operation fast, safely and to the highest quality standards.

Taking advantage of flexible mobdocks and years of experience our men carried out the repair while the ship stayed afloat. Because all the required material is ready to be transported at all times, no time is lost making preparations.

With Hydrex organizing everything from start to finish, the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced, he could sail his vessel to its next stop free of oil leaks.

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Recently our teams traveled across different continents and performed underwater seal replacements on five vessels in just over a month. Our diver/technicians travelled for repairs to Spain, then to Belgium, next on to Trinidad and Tobago, then to Colombia and finally back to Spain. By using our flexible mobdocks, all the repairs could be performed on-site and the ships did not have to go to drydock.

We can perform shaft seal operations on all types and sizes of shaft seals. This is illustrated by the range of ships our divers worked on: a yacht, a ferry, a RORO vessel, a general cargo ship, and a tanker.

On four of the five vessels oil leaks were the reason for the operation. These were caused by ropes and nets that got tangled in the stern tube seal assembly. The same procedure was followed for each repair.

After arriving on-site, the diving team first set up a monitoring station next to the vessel. Each operation started with a thorough underwater inspection of the stern tube seal assembly, and removal of the rope guard.

Our divers then cleaned the assembly and removed any fishing lines or nets that had become entangled. They then installed the flexible mobdock creating a dry underwater environment where they could work in drydock-like conditions.

Next the split ring was removed and brought to the surface to be cleaned. The divers then removed the first seal and replaced it with a new one which was bonded. Next, they did the same for the other two seals.

Each operation was concluded with successful leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard.

The operation on the yacht was slightly different. No oil leak was found on either of the two seal assemblies of the vessel, so only the two water seals needed to be replaced on each of the shafts. The procedure used for these repairs was the same as described above.

Taking advantage of our flexible mobdock technique, our men were able to carry out the repairs on-site and underwater. Because all the required material is ready to be transported at all times, no time was lost making preparations.

With Hydrex organizing everything from start to finish, the owners did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced, they could sail the ships to their next stop free of oil leaks.



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## Underwater Stern Tube Seal Repair on Container Ship in Algeciras

May 30, 2023

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Last month, one of our diver/technician teams carried out an underwater stern tube seal repair on a RORO ship berthed in Algeciras. The ship was suffering from an oil leak, making an on-site repair necessary. Using a Hydrex flexible mobdock, the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

Once the operation was approved all preparations were handled swiftly and the lightweight equipment was mobilized almost immediately from our fast response center.

The operation started with a thorough underwater inspection of the stern tube seal assembly, and removal of the rope guard.

Our divers then cleaned the assembly and installed the flexible mobdock, thus creating a dry underwater environment where they could work in drydock-like conditions.

The split ring was removed and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. Next, they did the same for the other seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard.

Working together with the OEM allowed us to provide our customer with original spare parts which guarantees the best quality material. A technician from the seal manufacturer was present during the operation.

Taking advantage of the Hydrex flexible mobdock technique, the entire operation could be completed with the ship afloat and carrying out normal operations. Because all the required equipment is ready to be transported at all times, no time was lost making preparations.

Hydrex organizing everything from start to finish meant the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced, he was able to sail his vessel to its next stop free of oil leaks.

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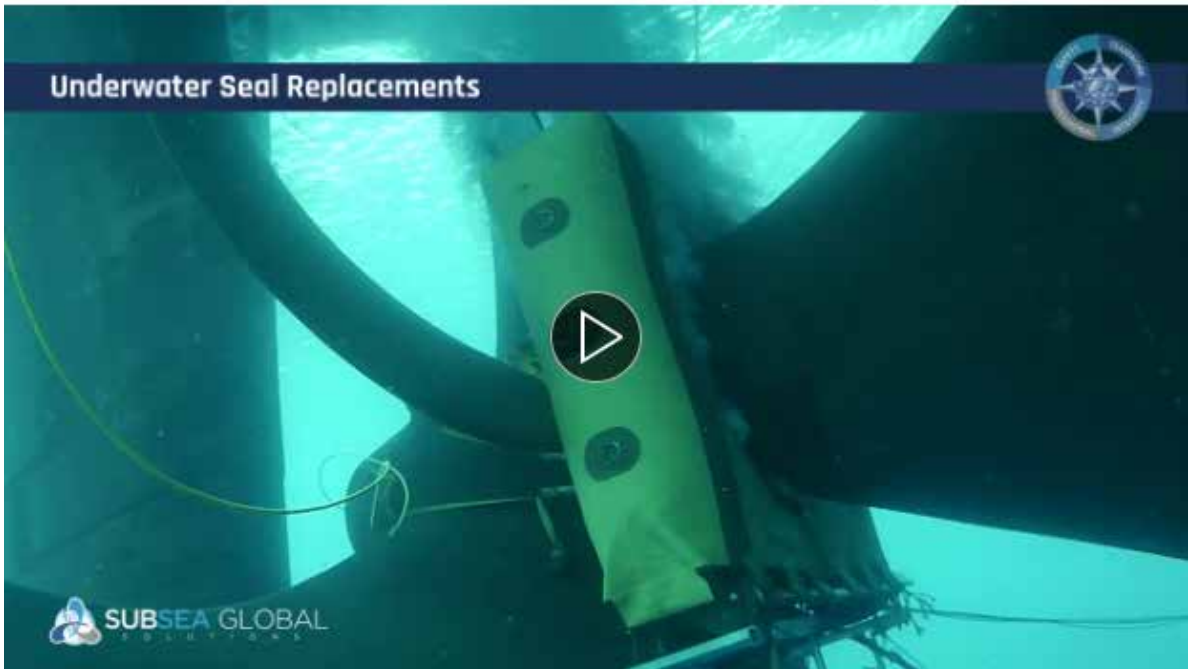


Stern tube leaking oil, TransHab habitat in-water repair.  
Vessel discovered an oil leak from its stern tube and to reduce pollution risks the local Coast Guard made return to service conditional on a repair that is normally done in dry-dock.

Subsea Global Solutions installed one of our portable TransHab habitat systems around the vessel's stern tube, our OEM certified diver-technicians then replaced the seals with new SKF elements. With tests done and the habitat removed, the vessel was quickly back in service. Client was very happy with a fast, cost effective solution and professional service delivery by the Port Angeles (Seattle) project team.

#commercialdiving #underwatertechnology #shiprepairs #shipmanagement

To find out more, or request this service <https://lnkd.in/eTm-UDpC>





## Double Stern Tube Seal Repair on Second Vessel in Tasmania Confirms Customer's Trust

January 26, 2023

At the end of 2022 our diver/technician teams carried out a double underwater stern tube seal repair on a RORO ship berthed in Port of Burnie, Tasmania. The ship was leaking oil, making an on-site repair necessary. Using two Hydrex flexible mobdocks simultaneously the team was able to carry out the entire operation on-site and underwater in just 60 hours, saving the owner an expensive and time-consuming trip to drydock.

After arriving on-site, the diving team first set up a monitoring station next to the vessel. The operation then started with a thorough underwater inspection of the stern tube seal assemblies. After the inspection the divers cleaned the assemblies and installed both flexible mobdocks. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The exact same procedure was followed on both stern tube seal assemblies. The split ring was first disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising OEM technician. The procedure was repeated with the other three seals. A successful operation was concluded with leakage tests, the removal of the flexible mobdocks and the reinstallation of the rope guards.

Despite the remote location of the RORO vessel, our technical department was able to make all practical logistic arrangements and organize a mobilization of the equipment very swiftly. In the recent past we have carried out several operations in Australia. Earlier in 2022 we mobilized to the same location for an identical job on the vessel's sister ship, so the customer knew we could perform the operation fast, safe and to the highest quality standard.

Taking advantage of our flexible mobdock technique our men were able to carry out the entire repair on-site and underwater. Because all the required material is ready to be transported at all times, no time is lost making preparations.

With Hydrex organizing everything from start to finish, the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced, he could sail his vessel to her next stop free of oil leaks.

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Concerned citizens in Gananoque, Ont., are speaking out about a cruise ship that's docked in the St. Lawrence River as they claim the boat was leaking oil for several days before action was taken. According to statement from City Cruises in Gananoque, crews discovered that one of its vessels was leaking oil into the water as they were preparing to take it out, just over a week ago, on November 18. The boat, named *Captain Matthew Flinders*, was docked in Gananoque on as it was being prepared for winter storage when staff noticed the leak.

In a statement sent to Global News the company said:

"As part of the swift action by our crew and the local fire department, GFL Environmental Inc. was immediately contacted for emergency assistance to contain and quickly remediate the situation. Our team quickly secured the source of the leak. We worked together with Transport Canada and the local fire department on the incident..."

However, one concerned citizen tells Global News, some local residents claim to have noticed the leak as early as Nov. 12 and reported it to the fire department. Those residents are wondering why nothing was done until six days later. No one from the Town of Gananoque was available to speak with Global News about the oil leak on Monday. According to City Cruises, they are continuing to work with their environmental remediation contractor to monitor the affected area.

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One of our diver/technician teams carried out an underwater stern tube seal repair on a 140-meter general cargo ship at anchorage in Port of Spain, Trinidad. The ship was leaking oil, making an immediate repair necessary. Using a Hydrex flexible mobdock the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

Once the operation was confirmed, all preparations were handled swiftly and the lightweight equipment was mobilized immediately from our headquarters in Antwerp. After arriving on-site, the diving team first set up a monitoring station on a workboat next to the vessel. The operation then started with the removal of the rope guard and a thorough underwater inspection of the stern tube seal assembly.

This revealed that a rope had become entangled around the stern tube seal causing the oil leak. Our divers removed the rope during the inspection. They then cleaned the assembly and installed the flexible mobdock. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The split ring was then removed and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was bonded. The procedure was repeated with the other seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard.

After all damaged seals had been successfully replaced, the owner could sail his vessel to its next stop free of oil leaks.

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# LinkedIn Post by AEGIR-Marine BV

August 12, 2022



AEGIR-Marine BV

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We all know that downtime costs money. That's why we cooperate with our sister company **UPE - Underwater Propulsion Engineers** to get clients back on the water as quickly as possible. Take this recent job in Sweden as an example: UPE's diver engineers worked for 24 hours in two shifts to inspect and replace stern tube seal components while our own team is busy in the vessel's engine room. Close cooperation gets the job done!

[#sternubeseal](#) [#getthejobdone](#) [#cooperation](#) [#AEGIRmarine](#) [#BuiltOnService](#)



# LinkedIn Post by Wärtsilä Underwater Services

July 6, 2022



Wärtsilä Underwater Services

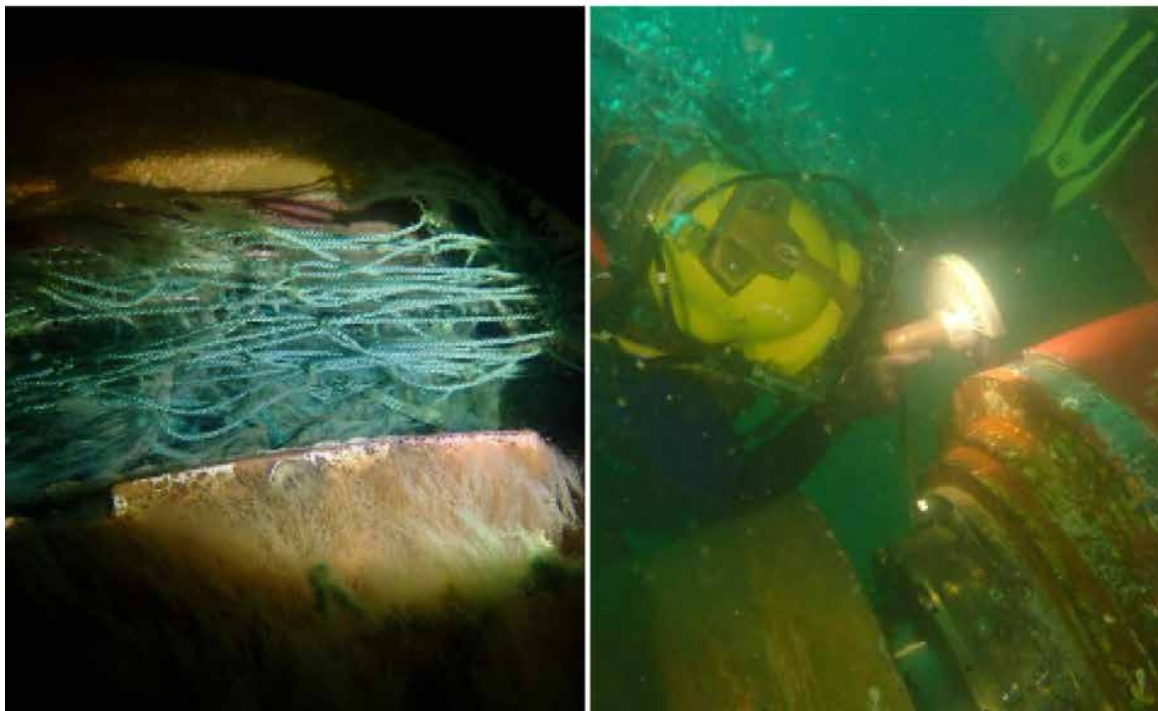
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MAY and JUNE are seal months for our teams all over the globe. In Panama, once more, another vessel has been repaired where our dive team renewed the lip seals after an entanglement was found inside the ropeguard. Using a habitat to create a dry environment, the 3 old lip seals were removed and 3 new seals were bonded in place. With the new seals in place and tested the ropeguard was reinstalled and welded back on.

#underwaterservice #underwaterrepairs #wartsila #martime



Recently one of our diver/technician teams carried out a double underwater stern tube seal repair on a RORO ship berthed in Port of Burnie, Tasmania. The ship was suffering from an oil leak, making an on-site repair necessary. Using two Hydrex flexible mobdocks simultaneously the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

After arriving on-site, the diving team first set up a monitoring station next to the vessel. The operation then started with a thorough underwater inspection of the stern tube seal assemblies. After the inspection the divers cleaned the assemblies and installed both flexible mobdocks. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The exact same procedure was followed on both stern tube seal assemblies. The split ring was first disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising OEM technician. The procedure was repeated with the other three seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdocks and the reinstallation of the rope guards.

Despite the remote location of the RORO vessel, our technical department was able to make all practical logistic arrangements and organize a mobilization of the equipment very swiftly. In the recent past we have carried out several operations in Australia, including repairs on this RORO ship's sister vessel.

Damaged stern tube seals will cause oil leaks or an ingress of water. By replacing the seals as soon as possible we can keep the down time low. Because seal repairs can be performed during cargo operations the ship can keep its schedule.

It is not always straightforward to replace seals. There can be quite a bit of variation in the size of the stern tube itself and, for instance, the liners can be worn down and show ruts. However, all this is routinely handled by our experienced teams.

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## Underwater Stern Tube Seal Repair on Container Ship in Algeciras

April 23, 2022

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Last month one of our diver/technician teams carried out an underwater stern tube seal repair on a container ship berthed in Algeciras. The ship was suffering from an oil leak, making an on-site repair necessary. Using a Hydrex flexible mobdock, the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

Once the operation was approved all preparations were handled swiftly and the lightweight equipment was mobilized almost immediately from our fast response center.

The operation started with a thorough underwater inspection of the stern tube seal assembly and removal of the rope guard. This revealed that a rope had become entangled around the stern tube seal assembly and had caused the oil leak.

Our divers removed the rope during the inspection. They then cleaned the assembly and installed the flexible mobdock. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The split ring was removed and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was bonded. They then did the same for the other seals.

Working together with the OEM allowed us to provide our customer with original spare parts which guarantees the best quality material. A technician from the seal manufacturer was present during the operation.

Hydrex organizing everything from start to finish meant the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced he was able to sail his vessel to her next stop free of oil leaks.

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## Reefer Container Ship Damaged, Returned to France for Repairs

November 24, 2021

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Reefer container ship *AUTUMN STREAM* left Radicatel port, Seine, France, on Nov 20, bound for Guadeloupe, but had to interrupt voyage and call Brest, understood under own power at reduced speed, after encountering propulsion problem. Divers found ship's propeller shaft entangled in hawser. The ship understood to be in need of dry docking, because hawser damages parts of propeller and propulsion system. She's to offload 178 containers on board.

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Our diver/technicians replaced the seals of both stern tube assemblies of a pipe laying vessel berthed in Rotterdam. Using a Hydrex flexible mobdock they were able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

A team traveled to the vessel's location on one of our workboats. These workboats are fully equipped as dive support stations with hydraulic cranes, winches, nautical and communication equipment, and a dive control room. They are stationed in Rotterdam and Antwerp which allows for a fast mobilization throughout both ports.

Once the operation was confirmed all preparations were handled swiftly and the lightweight equipment was mobilized. The operation then started with the removal of the rope guard and a thorough underwater inspection of the first stern tube seal assembly.

After the inspection the divers cleaned the assembly and installed the flexible mobdock. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The split ring was then removed and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was bonded. They then did the same for the other seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard. The procedure was repeated to remove the seals of the second stern tube assembly.

Working together with the OEM allowed Hydrex to provide the customer with original spare parts which guarantees the best quality material. A technician of the seal manufacturer was also present during the operation.

By organizing everything from start to finish the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced he could sail his vessel to its next stop free of oil leaks.

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August 2, 2021

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Hydrex mobilized diver/technician teams to vessels in the Netherlands and Australia to carry out stern tube seal replacements. In Flushing the repair was carried out on a 200-meter car carrier, and in Port Burnie, Tasmania, on a 188-meter RORO vessel.

Both ships were leaking oil, making an on-site repair necessary. Using a Hydrex flexible mobdock they were able to carry out these operations on-site and underwater, saving a trip to drydock.

Despite the remote location of the RORO vessel, the company's technical department was able to make all practical logistic arrangements and organize a mobilization of the equipment very swiftly. In the recent past they have carried out several operations in Australia, including repairs on this RORO's sister ship.

After arriving on-site, the diving team first set up a monitoring station next to the vessel. The operation then started with a thorough underwater inspection of the stern tube seal assembly.

Next the divers cleaned the assembly and installed the flexible mobdock, thereby creating a dry underwater environment so that they could work in drydock-like conditions.

The split ring was then disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising OEM technician. The procedure was repeated with the other three seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard.

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## Leaking Seal Assembly Fixed Underwater in Antwerp

December 9, 2020

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The Hydrex team carried out an underwater stern tube seal repair on a 300-meter container vessel berthed in Antwerp. The ship was suffering from an oil leak, making an immediate repair necessary. Using a Hydrex flexible mobdock the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

Once the operation was confirmed all preparations were handled swiftly and the lightweight equipment was mobilized immediately. After arriving on-site, the diving team first set up a monitoring station next to the vessel. The operation then started with the removal of the rope guard and a thorough underwater inspection of the stern tube seal assembly.

After the inspection the divers cleaned the assembly and installed the flexible mobdock. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The split ring was then removed and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was bonded. The procedure was repeated with the other seals.

A successful operation was concluded with leakage tests, the removal of the flexible mobdock and the reinstallation of the rope guard.

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## Underwater Stern Tube Seal Repair in Tasmania

January 30, 2020

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In January a Hydrex diver/technician team carried out an underwater stern tube seal repair on a RORO ship berthed in Port of Burnie, Tasmania. The ship was suffering from an oil leak, making an on-site repair necessary. Using a Hydrex flexible mobdock the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

The split ring was then disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising OEM technician. The procedure was repeated with the other three seals.

Damaged stern tube seals will cause oil leaks or an ingress of water. By replacing the seals as soon as possible we can keep the down time low. Because seal repairs can be performed during cargo operations the ship can keep its schedule.

It is not always straightforward to replace seals. There can be quite a bit of variation in the size of the stern tube itself and for instance the liners can be worn down and show ruts. However, all this is routinely handled by our experienced teams.

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## Fast Underwater Stern Tube Seal Replacement Avoids Need to Drydock

July 25, 2019

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Last month the Hydrex team carried out underwater stern tube seal repairs on a 192-meter RORO vessel in Rotterdam. The vessel was suffering from an oil leak, making a fast repair necessary. Our men carried out the entire operation on-site and underwater using a Hydrex flexible mobdock.

Every Hydrex office has a fast response center equipped with all the latest facilities, lightweight equipment and tools. These centers were designed specifically to increase speed of service. This allowed us to immediately mobilize a team on one of our workboats to the vessel's location.

The operation started with a thorough underwater inspection of the stern tube seal assembly. The divers then removed the rope guard of the vessel and installed the flexible mobdock around the stern tube seal assembly. This created a dry underwater environment to work in drydock-like conditions, a necessity for permanent stern tube seal repairs.

After cleaning the entire assembly the diver/technicians removed the three damaged seals one by one and replaced them with new ones. Because the existing running area was damaged, the team also installed a spacer ring to create a new running area for the seals. A service engineer of the OEM was present during the operation and gave his approval for the replacement.

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## Underwater Tanker Stern Tube Seal Repair 2019

June 7, 2019

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Last month, a Hydrex team carried out an underwater stern tube seal repair on a tanker berthed in Algeciras. The ship had suffered an oil leak and no drydock was available close by.

The divers replaced the damaged seals underwater using one of the company's flexible mobdocks. This saved the owner an expensive and time-consuming trip to a far away drydock.

Once the operation was confirmed, all preparations were handled swiftly and the lightweight equipment was mobilised almost immediately. The team was on-site and ready to start the seal replacement when the vessel arrived at Algeciras. The operation began with a thorough underwater inspection of the stern tube seal assembly. This revealed that a rope had become entangled around the assembly. The divers removed the rope but unfortunately it had already damaged the seals and caused an oil leak. The team then removed the rope guard and installed the flexible mobdock. This allowed them to work in dry conditions. During the operation divers removed the three damaged seals and replaced them with new ones.

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## **Stern Tube Seal Repairs Above and Below The Waterline**

January 30, 2019

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Recently our men carried out six stern tube seal operations all across Europe in a very short time span. The general cargo ship also suffered a leaking stern tube assembly. The owner contacted us and asked us to find the best possible afloat repair solution. Because the vessel could be trimmed we suggested to replace the damaged seals above water during the ship's stop in Ghent. The repair would be done in close cooperation with the OEM. After the seals had been replaced the assembly was closed again. Leakage tests were then successfully carried out. Our men repositioned and secured the rope guard. They removed the scaffolding to conclude the operation.



## **Underwater Stern Tube Seal Repair on Tanker in Tenerife**

January 15, 2019

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Last month one of Hydrex's diver/technician teams carried out an underwater stern tube seal repair on a tanker berthed in Tenerife, Spain. The ship was suffering from an oil leak, making an on-site repair necessary. Using one of the company's flexible mobdocks, the team was able to carry out the entire operation on-site and underwater. This saved the owner an expensive and time-consuming trip to drydock.

An earlier inspection had revealed that a rope had gotten entangled around the stern tube seal assembly. The rope was removed by divers during this inspection. Unfortunately the rope had damaged the seals and caused an oil leak. The owner of the tanker asked Hydrex to replace the damaged seals underwater so that he could keep his vessel on schedule.

During the operation Hydrex's divers removed the three damaged seals and replaced them with new ones. Working together with the OEM allowed Hydrex to provide its customer with original spare parts which guarantees the best quality material. A technician of the seal manufacturer was also present during the operation.

By organizing everything from start to finish the owner did not have to worry about making any arrangements for the repair. After the seals had been successfully replaced he could sail his vessel to her next stop free of oil leaks.



## Underwater Shaft Seal Repairs Around the Globe in Record Time

May 30, 2018

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Recently one of our diver/technician teams carried out an underwater stern tube seal repair on a tanker berthed in Antwerp. The ship was suffering from an oil leak, making an on-site repair necessary.

Once the operation was approved all preparations were handled swiftly and the lightweight equipment was mobilized almost immediately. Our team was on-site and ready to start the seal replacement when the vessel arrived in Antwerp. The operation started with a thorough underwater inspection of the stern tube seal assembly. It was revealed that a rope and a fishing net were entangled around it. Both were removed by our divers and the flexible mobdock was installed to allow for work in dry conditions. The team then removed the three damaged seals and replaced them with new ones. After the seals had been successfully replaced, the owner could sail his vessel to her next stop free of oil leaks. Despite the vessel's location close to our headquarters in Antwerp our well stocked fast response center nevertheless saved the owner a costly and unwelcome trip to drydock.

### Two Assemblies, Twelve Seals

A team of our divers traveled to Veracruz, Mexico for a stern tube seal repair. The operation consisted of the underwater replacement of the damaged seals on both assemblies of a semi-submersible offshore platform.

The unit left the field after its project was finished and was berthed alongside to have repair and maintenance work carried out without docking. We were asked to perform the stern tube seal repairs during the available window of opportunity.

After the diving team performed a thorough underwater inspection of the assembly they installed on of our flexible mobdocks. Next they removed the four damaged aft seals one by one and replaced them with new ones. The two forward seals were also replaced during the repair. The six seals of the starboard side assembly were then given the same treatment.



## Immediate Worldwide Mobilization Key Benefit for Underwater Shaft Seal Repairs

July 11, 2017

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A Hydrex diver/technician team carried out underwater stern tube seal repairs on a 138-meter LNG tanker during the vessel's stop in Singapore. The ship's stern tube was suffering an oil leak, making a quick on-site repair necessary. We have been using our flexible mobdock technology successfully for well over a decade and our teams have carried out many shaft seal replacements underwater in that period. As a result our technical department was able to offer a repair plan to the customer very quickly. Within a matter of days our diver/technicians were on-site and ready to start the seal replacement.

During the operation the team removed the three damaged seals and replaced them with new ones. Working together with the OEM allowed us to provide our customer with original spare parts which guarantees the best quality material. A technician of the seal manufacturer was also present during the operation.

## Hydrex Averts Canal Delay with Stern tube Renewal

January 5, 2017

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Hydrex Underwater Technology has assisted an excavation vessel haemorrhaging oil from a stern tube seal entangled with steel wire to pass safely through the Panama Canal. The 156m long, Dutch-owned vessel was unable to make the canal transit until the propeller shaft seal had been repaired, potentially delaying operations and resulting in financial penalty for the owner. Antwerp-headquartered underwater ship repair specialist Hydrex, however, repaired the leaky seal allowing the vessel to continue without disruption to its schedule.

“The ship needed to pass through the Panama Canal to reach its next destination, but the leak had to be repaired before it was allowed to do so. We immediately flew in a diving team to carry out a fast underwater repair so the vessel could continue,” said Dave Bleyenbergh, Hydrex Production Executive. “Our team arrived in Balboa, Panama, where the vessel lay at anchorage and sailed to the ship on a workboat loaded with all the equipment needed for the operation.” Following the dive team’s inspection of the seal, it was confirmed that steel cable was entwined around the seal, extensively damaging the stern tube assembly. The rope guard – a component designed to prevent ropes and wires from wrapping around the propeller – was found to be severely dented, destroying the seal’s splittyp housing. After removing the damaged components, which had already taken in water, the dive team set up a flexible Mobdock around the stern tube to create a dry environment in which to repair the equipment. Since the liner had been severely scuffed from the steel wire, this was the first component to be replaced, after which diver technicians bonded four new stern tube seals and installed a new housing arrangement. All remaining parts of the stern tube seal assembly were then reinstalled and secured, including a new rope guard.

## Hydrex Response Repairs Stern Seal in Record Time

October 5, 2016

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Hydrex Underwater Technology has completed the emergency stern tube seal repair to a 134m chemical tanker, after the Antwerp Port Authority demanded an underwater inspection and in-situ repair to the vessel before allowing it to set sail.

The vessel’s crew had carried out temporary repairs to stem the flow of lubricating oil from the stern, but the Port would not let the ship continue on her schedule before a dive team had inspected the propeller shaft seals.

At the request of the shipowner, Antwerp-based Hydrex mobilized a dive team which found the temporary fix had not completely stopped the oil leak. All four stern tube seals needed to be replaced. However, because the vessel had just been fully loaded, trimming the vessel was not an option so the repair had to be carried out in-situ, underwater.

Hydrex Production Executive Dave Bleyenbergh said: “We have been replacing seals underwater for 15 years with our award-winning flexible Mobdock technique. Use of the Mobdock allowed us to devise a repair plan very quickly after the inspection and expedite seal replacement without having to disrupt the owner’s schedule. We also arranged for the new seals and the manufacturer’s engineers to arrive at the Port in time to facilitate the repair in record time.

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## Seal Renewal in New Zealand in Tough Underwater Conditions

July 5, 2016

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In April, a Hydrex diver/technician team carried out underwater stern tube seal repairs on a container vessel in Tauranga, New Zealand. The ship was suffering from an oil leak and was not allowed to sail on. Because no drydock was available close by an on-site repair was necessary. Taking advantage of the Hydrex flexible mobdock technique the team was able to carry out the entire operation on-site and underwater.

A leaking seal is always an unpleasant experience for a ship owner. It will force him to go offhire, costing him time and money. To avoid going to drydock and keep the loss of time to the absolute minimum, Hydrex has developed the technology that enables repairs or replacement of all types of shaft seals to be carried out afloat. The ship can keep its schedule as seal repairs can be performed during cargo operations.



## Underwater Shaft Seal Renewal in Australia

August 19, 2015

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In May 2015 a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 200-meter RORO vessel in Port Kembla, Australia. The ships stern tube was suffering an oil leak, making an on-site repair necessary.

Taking advantage of the Hydrex flexible mobdock technique the team was able to carry out the entire repair on-site and underwater. During the operation the team removed the three damaged seals and replaced them with new ones provided by the OEM.

Despite the remote location of the vessel, our technical department was able to arrange a rapid mobilization of a team and equipment to Australia. In the past we have carried out several operations in Australia, among which an emergency stern tube seal repair on an offshore supply vessel in cooperation with Wartsila.

## MARINELOG Stern Tube Repairs

January 2015, page 28

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For instance, last November a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 196-meter LPG tanker in Panama. At the time, the ship was suffering from an oil leak, making an on-site repair necessary.

Using a Hydrex flexible mobdock technique the team was able to carry out the entire repair on-site and underwater. During the operation the team removed the four damaged seals one by one and replaced them with new ones.

**HYDREX:** In April a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 157 m dredger in Montevideo, Uruguay. The ship was suffering from an oil leak, making an on-site repair necessary. Using a Hydrex flexible mobdock the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

Oil was leaking from the stern tube seal assembly of a 157 m dredger. A team of Hydrex diver/technicians therefore mobilized to the vessel's location in Uruguay, together with all the needed equipment. After the diving team had set up a monitoring station they removed the rope guard and performed a thorough underwater inspection of the stern tube seal assembly. This revealed that the entire housing of the assembly was severely corroded and needed to be replaced. Because the housing consisted of split shells, this could easily be done by the Hydrex team.

Next they installed the flexible mobdock. By doing this, the divers created a dry working environment around the stern tube assembly. This is needed for any permanent stern tube seals repair. The team then removed the three damaged seals one by one and replaced them with new ones. Because the existing running area was worn out, the diver/technicians installed a spacer ring to create a new running area for the seals. Thanks to a newly developed method, this could also be done inside the flexible mobdock, saving precious time and avoiding water ingress during the installation of the spacer ring. Leakage tests were then carried out with positive results, after which the divers removed the flexible mobdock. The operation ended with the installation of a new rope guard. This was necessary because the old rope guard had suffered severe cavitation damage and could not be used again.

The stern tube seal repair was carried out in less than optimum conditions. There was almost no in-water visibility at Montevideo at the time of the repair. It made the diving operations a lot more challenging than expected. However, our divers are trained to be flexible and adapt to constantly changing working conditions making it possible for Hydrex to perform the stern tube seal repairs under the strictest safety regulations, to the highest quality standards and without any unnecessary delay. The dredger was able to leave Montevideo in time to sail to its next operation.

Atlantic Offshore Management's 2,200 dwt offshore supply ship *Ocean Osprey* carried out an emergency docking in March at Dales Marine's Aberdeen facility, having reported some propulsion problems. The vessel drydocked in Aberdeen, where it was discovered that her propeller had picked up a mooring rope. Work began straight away with removal of the tail shaft, including the blades.

Once the tail shaft had been drawn from the stern tube and lifted up on to the dockside, the mooring rope could be removed safely. The propeller blades were NDT checked prior to the tail shaft being reinstated into the stern tube, new seals were fitted and oil filled. Sea trials were carried out before the vessel went back on charter.

HYDREX: Last month a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 110 m offshore supply vessel in Bunbury, Australia. The rope guard covering the stern tube seal assembly was missing and the seal box had come loose after a mooring rope got tangled around the assembly. An emergency on-site repair was necessary. Hydrex therefore mobilized a diver/technician team to the vessel's location and was able to carry out the entire operation on-site and underwater. This operation saved the owner an expensive and time-consuming trip to drydock.

The diving team first set up a monitoring station. The operation then started with a thorough underwater inspection of the stern tube seal assembly. This revealed that a mooring rope had gotten tangled around the assembly, badly damaging it. Besides the missing rope guard, the seal box assembly bolts were broken off at the base flange ring. As a result the remaining seal box rings were hanging loose on the liner. This allowed seawater to come into the stern tube.

After the inspection the divers removed the broken bolts and installed a Hydrex flexible mobdock around the stern tube seal assembly. By doing this they created a dry underwater environment so that they could work in drydock-like conditions.

The split ring was then disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers installed a spacer ring to create a new running area for the seals. Next they removed the first seal and replaced it with a new one which was then bonded. This was done in cooperation with the supervising Wärtsilä specialist flown in from Sydney. The procedure was repeated with the other three seals. The operation ended with the conducting of successful leakage tests, the removal of the flexible mobdock and the installation of a new rope guard.

HYDREX: Last month a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 148 m container vessel in Port of Spain, Trinidad. The ship was suffering from an oil leak, making an on-site repair necessary. Using one of the company's flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving the owner an expensive and time-consuming trip to drydock.

The diving team first set up a monitoring station. The operation then started with a thorough underwater inspection of the stern tube seal assembly. After the inspection, the team detached the vessel's rope guard. Next the divers installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment so that they could work in drydock-like conditions. The split ring was then disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This procedure was repeated with the other two damaged seals.

The operation ended with the conducting of pressure tests with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard. Hydrex has carried out repairs and replacements on all types of seals on-site and underwater, for almost twenty years now. We constantly invest in the research necessary to continue to evolve repair techniques and procedures. The latest generation of flexible mobdocks allow us to carry out on-site replacement of virtually any type of stern tube seals very quickly.

Due to the very busy schedule in Port of Spain, the team had to halt the operation on several occasions when one of the vessels next to the container ship left or a new ship arrived. The ship also had to shift several times, making further interruptions necessary. Hydrex divers are however trained to handle these constant changing and challenging circumstances. They worked in shifts to finish the stern tube seal repairs as quickly as possible. Despite the breaks, the operation was carried out without any loss of quality. The owner could sail his vessel free of oil leaks and without having to go to drydock.

HYDREX: In August, the stern tube seals of a 67 m, 2,223 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.

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 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.



HYDREX: Recently Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 139m container vessel in Port Everglades, Florida, close to the company's office in Clearwater. The vessel was suffering from an oil leak, making a fast repair necessary. Using one of the company's next generation flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owners.

After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. The divers then removed the rope guard of the vessel as well as the fishing lines tangled around the liner that had caused the oil leak.

Next the team installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions, a necessity for permanent stern tube seal repairs. After cleaning the entire assembly, the divers disconnected the split ring and brought it to the surface. Next the team removed the three damaged seals one by one and replaced them with new ones. Because the existing running area was completely worn down, the diver/technicians also installed a spacer ring to create a new running area for the seals.

The operation ended with the conducting of a pressure test with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard. By creating a dry environment underwater, the divers were able to rapidly complete the required work on-site. The teams worked in shifts to perform the stern tube seal repairs within the shortest possible time frame. The in-situ repair saved the owner the time and money which going to drydock would have entailed.

2013SUBSEA GLOBAL SOLUTIONS: While cruising the Mediterranean Sea, a cruise vessel encountered excessive oil leakage on one of its propulsion shaft seals. Considering the severity of the situation, the client contacted Subsea Global Solutions (SGS) to dive into action. Maintaining specialized equipment in various locations throughout the world and maintaining fully certified diver / seal technicians on staff, a full complement of qualified personnel and equipment was efficiently dispatched to the vessel.

SGS' operations team worked together with the vessel's superintendent and operations staff to develop a time line for this repair to ensure the vessel would remain in service and not be delayed in any port of call. This required SGS to stage the gear prior to the vessels arrival. Upon its arrival into a port in Italy, SGS performed all of the preparatory work necessary to support the shaft seal renewal. This preparatory work included the removal of the rope guard using a carbon arc gouging system. By using this advanced technology to remove the rope guard, minimal prep work is required to reinstall the same rope guard since the cut line is clean and straight. With the preparatory work being performed in advance of the actual repair, this minimized the required time needed to renew all of the affected propeller shaft seals.

Upon the vessel's arrival in Malta, SGS' team of expert diver / technicians dove into action. The specialized flexible hyperbaric cofferdam, Transhab, was installed over the affected propeller shaft seal. With the space properly de-watered and sheltered from the sea, a factory authorized and class approved renewal of the shaft seals took place. All oil and water lip rings were removed, the seal housings were cleaned, liner was inspected and new oil and water lip rings were 'vulcanized' using OEM approved jigs, glues and procedures. With all the lip rings renewed the oil system was air tested, pressure tested and properly filled. The water lip rings were assembled around the propeller shaft, air tested and pressure tested. SGS completed the job in Malta in less than 48 hours by re-installing the rope guard utilizing the group's Class A wet welding procedures. Diver/Welders coded to SGS's class approved Class A wet welding procedures performed the welding on this critical component. By using coded underwater diver / welders to perform this weld repair ensures that at the conclusion of the repair there will be no notation from class on the rope guard weld repair performed. The vessel departed Malta on time with a happy crew and happy passengers!

HYDREX: In May, Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 292 m, 50,644 grt containership in Singapore. The ship was suffering from an oil leak, making a fast repair necessary. Using one of the company's flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owner.

After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. This revealed that a fishing line had caused the leak. After the inspection, the team detached the rope guard of the vessel. The fishing lines entangled around the liner were then removed. The divers then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions. The split ring was then disconnected and brought to the surface to be cleaned. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This procedure was repeated with the other two damaged seals.

The operation ended with the conducting of pressure tests with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard.

In February Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 139m container vessel in Port Everglades, Florida, close to the company's office in Clearwater. The vessel was suffering from an oil leak, making a fast repair necessary. Using one of the company's next generation flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owners.

After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. The divers then removed the rope guard of the vessel as well as the fishing lines tangled around the liner that had caused the oil leak.

Next the team installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions, a necessity for permanent stern tube seal repairs. After cleaning the entire assembly, the divers disconnected the split ring and brought it to the surface. Next the team removed the three damaged seals one by one and replaced them with new ones. Because the existing running area was completely worn down, the diver/technicians also installed a spacer ring to create a new running area for the seals.

The operation ended with the conducting of a pressure test with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard. By creating a dry environment underwater, the divers were able to rapidly complete the required work on-site. The teams worked in shifts to perform the stern tube seal repairs within the shortest possible time frame. The in-situ repair saved the owner the time and money which going to drydock would have entailed.

**HYDREX:** Last month a Hydrex diver/technician team carried out underwater stern tube seal repairs on a 190 m bulker vessel in Zeebrugge, Belgium, not far from headquarters in Antwerp. The repair was performed in icy weather conditions.

The vessel was suffering from an oil leak, making a fast repair necessary. Using one of the company's flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owners. After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. The divers discovered that the rope guard was missing. The team then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment, a necessity for permanent stern tube seal repairs. Next the team removed the damaged seals one by one and replaced them with new ones.

The operation ended with the conducting of a pressure test with positive results and the removal of the flexible mobdock. By creating a dry environment underwater, the divers were able to rapidly complete the required work on-site. Every day a ship has to go off-hire, which causes a substantial loss of money. The teams therefore worked in shifts to perform the stern tube seal repairs within the shortest possible time frame. The in-situ repair saved the owner the time and money which going to drydock would have entailed.

**HYDREX:** Recently Hydrex diver/technician teams have carried out two underwater stern tube seal repairs. One on a 143 m general cargo ship in Galveston, Texas, U.S.A., and one on a 292 m container vessel in Panama. Both vessels were experiencing oil leaks and a fast repair was required by the classification societies. Using the company's flexible mobdocks, Hydrex teams were able to perform both operations on-site and underwater. This saved time and money for both owners.

Both stern tube seal repairs were carried out in less than perfect conditions. There was almost no water visibility in Galveston at the time of the repair. This made the diving operations a lot more challenging than expected. In Panama the circumstances were better, but still far from ideal. This did not present any problem to the Hydrex diver/technicians. They are trained to be flexible and adapt to constantly changing working conditions. After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. The divers then removed the rope guard. The team then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions. This is a necessity for permanent stern tube seal repairs. After cleaning the entire assembly, the divers disconnected the split ring and brought it to the surface to be cleaned. Next the team removed the three damaged seals one by one and replaced them with new ones.

Oil was leaking from the stern tube seal assembly of a container vessel. Hydrex diver/technicians therefore mobilized to the vessel's location in Panama, together with all the needed equipment. The diving team first set up a monitoring station. Next they started the operation with a thorough underwater inspection of the stern tube seal assembly.

The underwater inspection revealed that the rope guard was missing. Fishing lines tangled around the liner had caused the oil leak. These were removed by the diver/technicians. The team then installed the flexible mobdock around the assembly. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This procedure was repeated with the other two damaged seals.

Both operations ended with the conducting of pressure tests with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard. Off-hire causes a substantial loss of money. The teams therefore worked in shifts to perform the stern tube seal repairs within the shortest possible time frame. This saved both owners the time and money which going to drydock would have entailed.

**SUBSEA SOLUTIONS ALLIANCE:** The Subsea Solutions Alliance was very busy in October and November meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed:

- Two Aft Shaft seals were replaced with flexible hyperbaric cofferdams in the Caribbean
- Two Aft Shaft seals were replaced at the same time with flexible hyperbaric cofferdam in Mexico
- One Aft Shaft seal was replaced with a flexible hyperbaric cofferdam in the Azores
- One Aft Shaft seal was replaced with a flexible hyperbaric cofferdam in Greece

**HYDREX:** Last month Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 242-meter container vessel close to the company's headquarters in Antwerp. The vessel was suffering from an oil leak, making a fast repair necessary. Using one of the company's flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owners.

Every Hydrex office has a fast response centre equipped with all the latest facilities, lightweight equipment and tools. These centres were designed specifically to increase speed of service. This allowed us to mobilize a team together with all the needed equipment to the vessel's location within the shortest possible time frame.

After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly. The divers then removed the rope guard of the vessel as well as the fishing lines tangled around the liner that had caused the oil leak.

The team then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions, a necessity for permanent stern tube seal repairs. After cleaning the entire assembly, the divers disconnected the split ring and brought it to the surface to be cleaned. Next the team removed the three damaged seals one by one and replaced them with new ones. Because the existing running area was completely worn down, the diver/technicians also installed a spacer ring to create a new running area for the seals. The operation ended with the conducting of a pressure test with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard.

By creating a dry environment underwater, the divers were able to rapidly complete the required work on-site. Every day a ship has to go off hire causes a substantial loss of money. The teams therefore worked in shifts to perform the stern tube seal repairs within the shortest possible time frame. This saved the owner the time and money which going to drydock would entail.

**SUBSEA SOLUTIONS ALLIANCE:** The Subsea Solutions Alliance (SSA) was very busy in September meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed:

- One Aft Shaft seal was replaced with a flexible hyperbaric cofferdam in the Azores
- Two Aft Shaft seals were replaced on a vessel with a flexible hyperbaric cofferdam in Bermuda
- Two Aft shaft seals were replaced on a vessel with a flexible hyperbaric cofferdam in Bermuda

When the fore, as well as the aft stern tube seals of a 247 m tanker were leaking oil, the vessel was not given permission to enter any ports. Unloading the vessel at sea and going to drydock seemed the only option for the vessel, until Hydrex sent a diver/technician team with one of the company's flexible mobdocks to the ship's location in Port Gentil, Gabon, to replace both sets of stern tube seals on-site.

The diving team made all remaining preparations for the main activity, which started, immediately after the meeting, with the removal of the rope guard. This was followed by a thorough underwater inspection and shaft wear down readings.

While the Hydrex flexible mobdock was installed around the stern tube seal assembly to create a dry underwater environment around the assembly, Hydrex technicians replaced the fore stern tube seals which are located on the inside. Next the team started the work on the aft seals. This was done inside the flexible mobdock in drydock-like conditions, which are essential for stern tube seal repairs. The diver/technicians cleaned the entire assembly before they removed the damaged seals one by one and replaced them with new ones. Like the fore seals, these were prepared onshore by the attending Aegir-Marine specialist.

All parts of the stern tube seal assembly were then reinstalled and secured. After a successful leakage test the team removed the flexible mobdock and repositioned the rope guard. By sending the Hydrex flexible mobdocks in our special fly away cases together with all equipment, fast response to any emergency call like this is guaranteed to locations around the world from the various Hydrex offices. Every day a ship has to go off hire causes a substantial loss of money, and having to arrange the vessel to be unloaded at sea would have been an organizational and financial disaster for the owner. By performing both the repair on-site and underwater, Hydrex made sure that the vessel could keep to its sailing schedule and did not have to go into drydock.

**SUBSEA SOLUTIONS ALLIANCE:** The Subsea Solutions Alliance (SSA) was very busy in August meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed.

- One Rudder repair was performed in the South America
- Two Shaft Seal repairs with hyperbaric lip seal bonding was performed on Azipods in Bermuda
- One Shaft Seal repair with hyperbaric lip seal bonding was performed in the Western Caribbean
- One Shaft Seal conversion was performed with a flexible hyperbaric cofferdam in the Western Caribbean

In July, Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 271 m oil tanker in Fujairah, and on a 195 m RORO vessel in Panama. Because both vessels were experiencing oil leaks, a fast repair was required by the classification societies. Using the company's flexible mobdocks, Hydrex teams were able to perform both operations on-site and underwater, saving time and money for both owners.

Both stern tube seal repairs had to be carried out in less than perfect conditions. The water temperature in Fujairah was close to 45° C while stormy weather caused strong swell. In Panama the circumstances were slightly less tropical, but still far from ideal. This brought about no problem for the Hydrex diver/technicians. They are trained to be flexible and adapt to constantly changing working conditions. On top of this, our technical department has many years of experience in dealing with all kinds of weather circumstances in locations around the world. The combination of this theoretical knowledge and the means for a practical execution, allowed Hydrex to perform both stern tube seal repairs in these harsh circumstances. This was done under the strictest possible safety regulations, to the highest quality standards and without any unnecessary delay.

After the inspection, the team removed the rope guard of the vessel. Fishing lines tangled around the liner had caused the oil leak. These were removed by the diver/technicians. The team then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions, a necessity for permanent stern tube seal repairs. Next the split ring was disconnected and brought to the surface to be cleaned. Subsequently the team removed the three damaged aft seals one

by one and replaced them with new ones.

When oil was leaking from the stern tube seal assembly of a RORO vessel, Hydrex diver/technicians mobilized to the vessel's location in Panama, together with all the needed equipment. After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly.

The underwater inspection revealed that a fishing line had caused the leak. The team removed the rope guard and installed the flexible mobdock around the assembly. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This procedure was repeated with the other two damaged seals. The team also installed a spacer ring, thus creating a new running area for the seals.



**HYDREX:** Last month Hydrex diver/technician teams carried out underwater stern tube seal repairs on a 130 m oil tanker in Rotterdam, the Netherlands, and on a 261 m container vessel in Singapore. Both vessels were suffering oil leaks, making a fast repair necessary. Using one of the company's flexible mobdocks the team was able to carry out the entire operation on-site and underwater, saving time and money for the owners.

Every Hydrex office has a fast response centre equipped with all the latest facilities, lightweight equipment and tools. These centres were designed specifically to increase speed of service and allowed us to mobilize diver/technician teams to both vessels within the shortest possible time frame.

When oil was leaking from the stern tube seal assembly of an oil tanker, diver/technicians mobilized from the Hydrex office in Antwerp to the vessel's location in Rotterdam together with all the needed equipment. After the diving team had set up a monitoring station, the operation started with a thorough underwater inspection of the stern tube seal assembly.

After the inspection, the team removed the rope guard of the vessel. Fishing lines tangled around the liner had caused the oil leak. These were removed by the diver/technicians. The team then installed the flexible mobdock around the stern tube seal assembly creating a dry underwater environment for the divers to work in drydock-like conditions, a necessity for permanent stern tube seal repairs. The split ring was then disconnected and brought to the surface to be cleaned. Next the team removed the three damaged seals one by one and replace them with new ones.

The lightweight flexible mobdocks packed in flight containers allowed for a very fast mobilization and a timely arrival in Singapore of the Hydrex team. A storm was passing over when the team arrived at the container vessel's location. This meant that the Hydrex divers had to pause the repair on several occasions due to strong currents and could only start the underwater operations again when the weather had improved slightly and full safety could be guaranteed for the divers.

After an underwater inspection revealed that a fishing line had caused the leak, the team removed the rope guard and installed the flexible mobdock around the assembly. After cleaning the entire assembly, the divers removed the first seal and replaced it with a new one which was then bonded. This procedure was repeated with the other two damaged seals. Both operations ended with the conducting of pressure tests with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard.

**NAVANTIA:** Spain's Navantia, Fene-Ferrol has focused its shiprepair activity in May on the drydocking and repairs of nine commercial vessels with and six military units for the Spanish Navy. The dredger *Dravo Costa Dorada*, from the repeat client Dravosa, drydocked into the No.1 dock at Cadiz at the end of the month to carry out a non-scheduled drydocking – replacing the stern tube seals by bonding, while the owner decided to replace an auxiliary engine cooler and also some associated piping.

**SWANSEA DRYDOCKS:** The latest repair facility to re-open is Swansea Drydocks, located in UK's Associated British Ports' (ABP) Port of Swansea. The yard's first repair contract, in January 2012, involved Robert Wynn's sea-going barge *Terra Marique*. The second vessel drydocked was the 3,008 grt NERC-owned research vessel *RRS Discovery*, which entered the yard during early April and is due to leave this week. The repair work involved an emergency drydocking for the tailshaft, which was leaking oil. Work also included some general maintenance.

**SUBSEA SOLUTIONS:** The Subsea Solutions Alliance (SSA) was very busy in March meeting the needs of the industry by its various members performing a number of high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed:

- One Aft Shaft Seal with Hyperbaric bonding was performed in the Caribbean

**HYDREX:** Last month Belgium's Hydrex mobilized a diver/technician team to a 145 m general cargo vessel in Las Palmas, Spain when oil was leaking from the stern tube seal assembly of the ship. The team used the Hydrex flexible mobdock technique to create a dry working environment around the assembly and replaced three damaged stern tube seals on-site, in drydock-like conditions.

The operation started with a thorough underwater inspection of the stern tube seal assembly. This revealed that the rope guard was missing. The team also found a rope entangled around the assembly, damaging the stern tube seals and causing the oil leak.

Two of the split rings were then disconnected and brought to the surface to be cleaned. Next the diver/technicians installed the Hydrex flexible mobdock around the stern tube seal assembly. This allowed the team to work on the assembly in dry conditions, a necessity for permanent stern tube seal repairs.

The divers then replaced the three seals one by one with new ones. After these were bonded, the team reassembled the entire unit and pressure tests were carried out with positive results. The flexible mobdock was then removed, concluding the repair. Because a new rope guard could not be delivered on time, the ship superintendent decided to have it delivered to the vessel's next stop in Philadelphia, U.S.A.

In order to provide the customer with the fastest possible response, flexibility was essential throughout the entire operation. Every day a ship has to go off hire causes a substantial loss of money. The team therefore worked in shifts to perform the stern tube seal repair within the shortest possible time frame. Keeping his vessel out of drydock saved the customer a great deal of time and money.

HYDREX: When a 204 m cruise vessel (*Adonia* as noted below) suffered an oil leak in its stern tube seal assembly, Hydrex was asked to carry out a permanent seal replacement. The repair was carried out with the Hydrex flexible mobdock technique and performed in stages to allow the ship to keep the tight schedule of the cruise it was on.

A small Hydrex diver/technician team met up with the ship in Kusadasi, Turkey and removed the starboard side rope guard. This was done to shorten the time required for the actual replacement of the stern tube seals. It was essential in fitting the operation within the short stop the vessel made in the next harbour on its trip. The team was then completed with additional diver/technicians and sailed to Greece on board the cruise ship.

As soon as the vessel arrived in Piraeus, the Hydrex diver/technicians set up a monitoring station next to the ship and made all necessary preparations for the main part of the operation. The team then installed the Hydrex flexible mobdock around the stern tube seal assembly. This created a dry working environment underwater in which to carry out the repair in the drydock like conditions, necessary when replacing seals.

After the diver/technicians had opened up the assembly they removed the damaged stern tube seals, one by one and replaced them with new ones. A subsequent leakage test showed that the repair was successful. The team then closed the stern tube seal assembly again and removed the flexible mobdock. This ended the second part of the operation well in time for the cruise ship to sail to its next stop with its passengers.

In Istanbul, Turkey, the team met up with the vessel again and refitted the rope guard onto the stern tube seal assembly, concluding the operation. The ship could continue its journey free of oil leaks without going to drydock and without any changes to its schedule.

P&O Cruises' 30,000-ton, 710-passenger *Adonia* arrived in the Cornish port of Falmouth yesterday for a four-day rush job of 'emergency repairs' before the ship departs Southampton on January 13 for an 87-day South America voyage.

A ten-day Mediterranean cruise had to be cancelled to make way for this unscheduled spell in the yard, with affected passengers being offered compensation and refunds.

P&O Cruises has been cagey about what *Adonia's* repairs actually are, although this has not stopped ship enthusiasts speculating. Cruise Critic members report divers inspecting the ship's hull last time it was in Southampton. Web site Ship Tracking claims it's emergency work on the ship's prop-shaft seals, while Manoverboard, a member of P&O Cruises' own forum, claims to have been told: "The issue relates to an oil leakage and this has to be rectified because failure to do so will mean that *Adonia* will not be allowed entry into USA waters during her 2012 World Cruise."

What we do know is that the shipyard, A&P Falmouth, is pulling out all the stops to complete the work, a spokesman telling the BBC that it would be a '24 hour-a-day job', with other projects being moved to accommodate *Adonia*. A&P's website claims that the Falmouth facility is the 'largest ship repair complex in the U.K.' A spokeswoman for P&O Cruises told Cruise Critic that "Falmouth was chosen as it was convenient, not far away and they are capable of doing the work."

– by Sue Bryant, Cruise Critic Contributing Editor

**SUBSEA SOLUTIONS ALLIANCE:** The Subsea Solutions Alliance was very busy over the past month meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed:

- A permanent weld repair was performed to the sea chest of a vessel on the US West Coast
- A mono-block propeller repair with cold static load straightening was performed on the US East Coast
- An aft stern Face seal was repaired completely wet on the US West Coast

**SUBSEA SOLUTIONS ALLIANCE:** The Subsea Solutions Alliance (SSA) was very busy this period meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed.

- An aft stern Lip seal system was repaired with a flexible hyperbaric cofferdam in the Middle East
- An aft stern Lip seal system was repaired with a flexible hyperbaric cofferdam in Central America
- An aft stern Lip seal system was repaired with a flexible hyperbaric cofferdam on the US East Coast
- An aft stern Lip seal system was repaired with a flexible hyperbaric cofferdam in the South Pacific
- An aft stern Lip seal system was repaired with a flexible hyperbaric cofferdam in Europe
- An aft stern Face seal was repaired completely wet in the Caribbean



## **Successful Renewal of the Tail Shaft Seal for M/V Ostsee Merchant**

December 17, 2011

M/V *Ostsee Merchant* is a 64,000 DWT Panamax bulk carrier with the main dimensions of 213x32x16m. The main problem for the vessel was the oil leakage of the tail shaft aft seal, which required an out-of-dock renewal of the seal. For such a hard and unconventional job, the shipyard's engineering personnel considered what the owners' thought and decided to fulfill this project on the premise of guaranteeing the safety after careful research.

**HYDREX:** To save time and money for the owners of a 270 m container vessel that was leaking oil, a Hydrex diver/technician team replaced four stern tube seals on site, using one of Hydrex's flexible mobdocks. This enabled the team to carry out the entire operation underwater during the vessel's stop in Algeciras.

The diver/technicians mobilized from the Hydrex office in Algeciras, arriving at the dock together with all the needed equipment. The Hydrex team leader met up with the vessel's owner and superintendent while the rest of the diving team set up a work station to monitor all underwater activities. Next, all quayside preparations were made for the main activity, which started immediately with the removal of the rope guard. This was followed by a thorough underwater inspection and shaft wear down readings.

Next the flexible mobdock was installed, creating a dry working environment for the divers, making it possible for the entire stern tube assembly to be cleaned. Because the forward seals were damaged as well, the team first replaced both of them and created a new running area. Hydrex diver/technicians then entered the dry underwater environment created around the stern tube seal assembly by the flexible mobdock. The four aft stern tube seals were replaced and bonded one by one. The team created a new running area for these seals as well.

Subsequently all parts were reinstalled and secured. After a leakage test was successfully performed, the rope guard was welded on again.

## Afloat Stern Tube Seal Repair

September 15, 2011

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After an underwater inspection of a bulk carrier, a fishing line wrapped around the shaft was found. Combined with a raised oil level in the stern tube header tank, the conclusion was that the aft seal was leaking.

The customer consulted FN Seals, specialized in stern tube seal maintenance and repairs, to perform the repair in the Port of Rotterdam. The decision was made for an AFLOAT repair, using the proven seal bonding process of Versitec Marine & Industrial, saving significant time and cost.

Versitec Europe quickly supplied new Viton sealing rings, spacer ring and small spares compatible with the Kobelco stern tube seal.

After discharging the ship was shifted to a repair buoy and during disassembly of the aft seal the FN Seals team discovered significant scoring on the aft liner. FN Seals installed the split spacer ring so as to reposition the new seal rings on the liner and allowing correct sealing. As a result of the excellent collaboration of all parties involved the repair on the aft seal was done with minimum delay for the vessel.

**SRN** | Ship  
Repair  
Newsletter

**Issue No: 1371**

September 9, 2011

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While June proved to be the month of the 'Rudder' the expert diver/technicians of the SSA found that July proved to be the month of the 'Aft propeller shaft seal'. Projects were performed in five different ports of call on two continents. Combining our expertise in the performance of these types of repairs with our exclusive underwater authorization from Germany's Blohm and Voss Industries (Simplex seals), the SSA provided the critical in-water support to vessels under the watchful eyes of the assigned classification society and in some cases the US Coast guard. If the ship's in the water, they can fix it; that is what the SSA is all about.

The SSA was very busy in July meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed:

- A podded propeller repair with sectional reduction was performed in Central Europe
- A monoblock propeller repair with sectional reduction was performed in West Africa
- Three aft stern seals were repaired with a flexible hyperbaric cofferdam on the West Coast of the USA
- An aft stern seal was repaired with a flexible hyperbaric cofferdam in Africa
- An aft stern seal was repaired with a flexible hyperbaric cofferdam on the Gulf coast of the USA

The importance of regularly recording shaftline clearances including gearbox output shafts for vessels with this configuration has been highlighted by a recent stern tube and gearbox repair.

A leaking stern tube bearing seal was the tangible result of excessive bearing wear in the reduction gearbox output shaft bearing, causing sufficient eccentricity to the shaft's operation

which set up a pumping action in the aft stern seal, leading to eventual stern tube bearing failure. The repair cost the owners an unplanned drydocking and vessel downtime.

A large purse-seiner tuna vessel (1,678gt) reported problems with a constant and large ingress of sea water via the stern tube. The vessel had a fixed pitch propeller driven by a 4,045kW, EMD main engine via a 350mm diameter tailshaft. The gearbox (Falk), incorporated the thrust bearing, and the short stiff shaftline did not need intermediate shaft bearings. As a result the vessel was subsequently drydocked where a thorough investigation took place, and as the outboard stern seal was released and stern tube oil drained, seawater contamination was immediately obvious from the discolouration of the emulsion that was released.

Further evidence of the unwelcome ingress of water, and a disconcerting symptom of what lay ahead appeared when the inboard stern tube seal was released, and a large amount of white metal debris was found in the forward area of the inboard bearing.

Once the tailshaft coupling was separated, the gearbox output shaft clearance was measured and this was found to be the root cause of the problem. The investigation was carried out using a hydraulic jack to lift the shaft while a dial gauge was used to measure the clearance. A reading of 0.60mm was obtained, which is considerably above the manufacturer's tolerance allowed, indicating worn bearings in the reduction gearbox.

The tailshaft was subsequently withdrawn and it was now evident that both the forward and aft white metal stern tube bearings had been badly damaged. The tailshaft bearing journals were also showing signs of deep radial scoring. In addition, some damage was evident on both forward and aft stern tube seal liners and the forward seal liner had come into contact with the forward stem tube bearing as a result of that bearing's collapse.

Having established the extent of the repairs required, the first task was to re-metal and machine to tolerance both forward and aft stern tube white metal bearings. Next, the tailshaft stern tube bearing journals were machined to clean up the scoring. This produced a slightly undersize tailshaft and the white metal stern tube bearings were machined slightly oversize to compensate.

In preparation to refit the forward and aft stern tube bearings and subsequently the tailshaft itself, the stemtube, its lubrication lines and all the tanks were thoroughly cleaned and flushed to remove any trace of contamination or debris. Finally, both forward and aft seal liners were renewed and the seal packs rebuilt and refitted.

With the stern tube repairs well underway the attention turned to the root cause of the problem which was the worn reduction gearbox output shaft bearings.

After the reduction gearbox was opened up and the gearing removed, new bearings were fitted on all the gear shafts. However it was found that three of the tapered roller bearings had spun in their housings. This required the bearing housings to be in line bored and new sleeves machined and fitted allowing standard replacement bearings to be used. On completion of rebuilding the reduction gearbox, it was re-bolted to the foundations using the existing shims. The run-outs were checked and the tolerances were found to be within specification. Finally the tailshaft couplings were tightened.

The Hydrex office in Clearwater, Florida, in the Tampa Bay area is fully established and ready to mobilize immediately. Underwater stern tube seal replacements on vessels berthed in New York, Gulfport (Mississippi), and Mobile (Alabama) were carried out by Hydrex diver/technicians. All three vessels had oil leaks and were not allowed to sail unless permanent repairs were carried out. The U.S. Coast Guard has very strict policies concerning environmental risks and would not let the vessels sail to a different location before the oil leaks had been permanently repaired. Therefore a team immediately left from the Hydrex office in Clearwater, Tampa together with the needed equipment on each occasion and set up a diving station at the berthing location of the respective ships. Hydrex teams carried out the repairs with the use of the company's proprietary flexible mobdock technique which allows divers to create a dry environment around the stern tube seal assembly. This enables them to carry out any required work in-situ and underwater but in a dry environment, saving the owner the time and money which going to drydock would entail.

A full inspection of the vessel in New York revealed that huge quantities of fishing line and nets around the stern tube seal assembly had caused the oil leak. Moreover, the inspection also revealed that part of one of the propeller blades was also missing, causing it to lose its balance and its optimum efficiency. Arrangements were made to perform a propeller repair while the Hydrex diving team replaced the worn seals one by one with new seals. By cropping the opposite blade to exactly the same shape as the damaged blade, the propeller's performance was brought back into balance.

The operation in Gulfport started with a thorough underwater inspection of the stern tube seal assembly. This revealed that the running surface of the stern tube seals was severely worn and no longer functional. After a discussion with all parties involved, it was decided to remove the spacer ring and create a new running area. The team then installed the flexible mobdock and replaced the damaged seals. Next they reassembled the entire unit and carried out wear-down measurements with positive results.

The seal repair on the vessel in Mobile, Alabama had to be performed before the ship was transferred to a new chartering party. Hydrex diver/technicians already performed a similar operation on one of the customer's other vessels so he knew that Hydrex has well trained diving teams and knows how to handle this kind of situation without loss of quality or time.

After the preliminary underwater inspection of the stern tube seal assembly and the installation of the flexible mobdock, the team removed the old seals. Next they positioned and bonded the new seals. The entire unit was reassembled and pressure tests were carried out with positive results.

Every day a ship has to go off hire brings about a substantial loss of money. Flexibility is therefore essential during operations like these. The teams worked in shifts to perform the operations within the shortest possible timeframe. Much to the satisfaction of the ship owners, Hydrex was able to perform the repairs in a very tight timeframe with no time wasted.

Hydrex Spain recently carried out propeller modifications, pipe repairs, rudder repairs, insert repairs and several stern tube seal repairs in Algeciras, propeller modifications in Cadiz and an azimuth bow thruster removal and reinstallation on a pipe laying vessel in Cartagena.



HYDREX: Last week a Hydrex diver/technician team replaced three seals on a 180-meter tanker berthed in New York while concurrently cropping two of its propeller blades to restore balance to the propeller. The team mobilized from the Hydrex office in Tampa together with all the equipment they needed for the operation. In New York an Aegir Marine specialist joined the team at the ship's location and the team made all necessary preparations to begin the repair. Both operations were carried out at the same time while the ship was trimmed and at some 60 m from the quayside.

The stern tube seals needed attention because water was leaking into the monitoring tank. To gain access to them, part of the team built a scaffolding around the assembly. They could then remove the rope guard and carry out an inspection of the entire assembly. This revealed that the two water seals and the oil seal were completely worn, causing the leak, and needed replacing. The diver/technicians then removed the stern tube seals one by one and replaced them with new ones. These were prepared by the Aegir Marine specialist before they were positioned and bonded.



## Marfret Newsletter

April, 2011

Following an oil leak on its stern tube recently, the vessel's crew and technical staff were involved in a somewhat unorthodox repair operation that left the ship with its poop in the air.

During a crossing between Le Havre and Saint-Martin at the beginning of February, the *Marfret Douce France* suffered damaged to the seal on its stern tube, which carries the propeller shaft and is supported by the stern frame of the ship. "We immediately took action to stem the leak by changing the viscosity of the oil being used," explains technical director Pierre Albrieux, the person in charge of the Marfret fleet.

Last month a Hydrex diver-technician team performed a crack repair on the pintle area of the rudder of a 181 m tanker and performed a detailed inspection of the stern tube seal assembly of the vessel while it was berthed in Ghent, Belgium. Following this inspection the team replaced the worn seals and installed a spacer ring, thus creating a new running area for the seals.

Prior to the operation the vessel was trimmed as much as possible. Hydrex then built scaffolding around the rudder pintle and the stern tube seal assembly. Next they removed the rope guard and the damaged areas of the outer plating of the rudder. This allowed them to perform an inspection of the stern tube seal assembly and start the repair in the rudder.

While the team prepared a first insert plate on shore, the inspection of the seal assembly revealed that the seals were worn and needed replacement. Next they installed the first insert and secured it while the second plate was prepared. Simultaneously another part of the team opened the stern tube seal assembly and it became clear that they needed to renew the running area of the seals as well. The team did this by installing a new spacer ring on the stern tube flange after which they replaced and bonded the three seals.

By then the rest of the team had closed the stern tube seal assembly and an oil test had been performed, verifying the seal repair had been carried out with satisfactory results.

SSA: While, during January, the Northeastern USA remained frozen under large amounts of snow and ice, the diver/technicians of the Subsea Solutions Alliance (SSA) remains active submerged below installations throughout the world. From enduring the frozen waters of the Canadian Maritimes to enjoying the warm clear waters of the Caribbean, the SSA remains actively engaged in the underwater maintenance and repair of vessels throughout the world. Coming out of a very busy work schedule during the Christmas and New Year's celebrations, the member companies continue to perform critical repairs to aft stern seals, tunnel and azimuthing thrusters, propellers and hull structures.

The SSA was very busy in January meeting the needs of the industry by performing multiple high value repairs in various ports around the world in addition to the normal ship's husbandry, inspection work and routine diving maintenance. The summary below illustrates just some of the major projects performed.

- Two tunnel thruster lower units were repaired in the Caribbean
- A tunnel thruster lower unit was repaired in the Middle East
- A tunnel thruster tunnel was permanently repaired on the US West Coast
- A Tunnel Thruster lower unit was repaired hyperbarically in the Caribbean
- A retractable azimuthing thruster was re-aligned and repaired in West Africa
- A ship shaft aft stern seal was overhauled/repared hyperbarically in the US Northeast
- A ship aft stern seal was overhauled/repared hyperbarically in the US Southeast
- A ship shaft aft stern seal was overhauled/repared hyperbarically in the Caribbean
- A ship shaft aft stern seal was overhauled and repaired wet in the Mexico.
- A controlled propeller repair was performed on the US Southeast
- A fixed pitch propeller was repaired in Europe

January also afforded diver/technicians from the SSA's member company All-Sea Atlantic the unique opportunity to train its staff on the deployment and retrieval of divers in a harsh environment.

The Hydrex flexible mobdock technique was recently used to perform two underwater stern tube seal repairs. Three seals were replaced in Algeciras on a 250 m RORO vessel that was suffering from an oil leak, while the aft stern tube seal assembly of a 210 m containership was partly repositioned in Le Havre to stop an oil blockage.

Every Hydrex office has a fast response centre equipped with all the latest facilities, lightweight equipment and tools. These centres were designed specifically to increase speed of service and allowed us to mobilize diver-technician teams to both vessels, from our offices in Algeciras Bay and our headquarters in Antwerp respectively.

After a thorough underwater inspection, the rope guard of the vessel in Cadiz was removed. The split ring was then disconnected and brought to the surface to be cleaned. Next the Hydrex flexible mobdock was installed around the stern tube seal assembly and a dry underwater environment was created in which the diver-technicians could remove the damaged seals one by one and replace them with new ones.

After the rope guard was removed during the operation in Le Havre the diver-technicians discovered that the oil flow through the stern tube seal assembly was blocked. This was caused by the intermediate and support rings both having been turned 180 degrees the wrong way. After the flexible mobdock was installed, the assembly was opened up and all parts were closely investigated and cleaned. This inspection revealed that all seals were in good condition but that the bonding was in bad condition. The bonding of the seals was consequently repaired after which the seal assembly was refitted the proper way.

Both operations ended with the conducting of pressure tests with positive results, the removal of the flexible mobdock and the reinstallation of the rope guard. The RORO vessel needed to cross the ocean after its stop in Algeciras, but would not have been allowed entrance to any port in the United States due to the U.S. Coast Guard's very strict policies concerning environmental risks. Thanks to Hydrex's fast response, the captain could continue on his schedule with the oil leak repaired and with only a minimum of delay.

SSA: The Subsea Solutions Alliance (SSA) was very busy in October and November meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed.

- One Tunnel Thruster lower unit exchange was performed in the Caribbean
- Two Tunnel Thrusters were repaired dry in-water in the Far East
- One Azimuthing demountable thruster was exchanged in Europe
- One Ship shaft aft stern seal was overhauled / repaired hyperbarically in Europe
- One Ship shaft aft stern seal was overhauled / repaired wet in Mexico
- One Temporary wet weld repair to shell plating was performed in the Canadian Arctic and Greenland

HYDREX: When oil was leaking from the stern tube seals of a general cargo vessel, Hydrex mobilized a certified diver-technician team to the vessel's location in Mobile, Alabama, to perform underwater stern tube seal repairs before the ship was transferred to a new chartering party.

Hydrex had already performed a similar operation on one of the customer's other vessels so he knew that Hydrex has well trained diving teams and knows how to handle this kind of situation without loss of quality or time for the customer. Every Hydrex office has a fast response centre equipped with all the latest facilities, lightweight equipment and tools. These centres are designed specifically to increase speed of service and allow for immediate mobilization to almost anywhere in the world.

Because the U.S. Coast Guard has very strict policies concerning environmental risks, they would not allow the vessel to sail to a different location before the oil leak had been permanently fixed. A team immediately left from the Hydrex office in Clearwater, Tampa, together with the needed equipment, and set up a diving station at the berthing location of the ship.

The operation started with a thorough underwater inspection of the stern tube seal assembly and removal of the rope guard. The split ring was then disconnected and brought to the surface to be cleaned. Next the Hydrex flexible mobdock was installed around the stern tube seal assembly and a dry underwater environment was created in which the diver-technicians could remove the damaged seals one by one and replace them with new ones. After these were bonded the entire assembly was put together again and pressure tests were carried out with positive results. The flexible mobdock was then removed and the rope guard was reinstalled, concluding the repair.

During the operation it became clear that a damaged liner was the cause of the oil leak and would have to be replaced during the next scheduled drydocking of the vessel to prevent a later reoccurrence of the problem. In order to provide the customer with the fastest possible response, flexibility was essential throughout the entire operation. Every day a ship has to go off hire causes a substantial loss of money. Hydrex was able to perform the repairs in a very tight timeframe and made sure that the new charterer could sail the vessel free of oil leaks.

## Corporation Pleads Guilty to Oil Pollution Violations

June 23, 2010

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STANSHIPS, INC., headquartered in Athens, Greece, pled guilty today in federal court in New Orleans, Louisiana for violating the Act to Prevent Pollution from Ships (APPS) and the Clean Water Act, announced U. S. Attorney Jim Letten.

According to court documents, STANSHIPS was charged in a bill of information with presenting a false Oil Record Book to the U. S. Coast Guard, and for discharging lubricating oil from the stern tube of the *M/V Doric Glory* into the navigable waters and contiguous zone of the United States and the Exclusive Economic Zone belonging to the United States in the Gulf of Mexico.

According to the plea agreement, STANSHIPS will pay a \$700,000 criminal penalty: a \$525,000 fine and a separate \$175,000 community service payment to the National Fish and Wildlife Fund and earmarked for the purpose of funding habitat conservation, protection, restoration and management projects to benefit fish and wildlife resources and the habitats in the Eastern District of Louisiana. Further, STANSHIPS will also serve three years probation and as a condition of the probation, the company must be in compliance with all requirements of an Environmental Compliance Plan.

According to the factual basis, STANSHIPS admitted that from at least as of December 15, 2009, and continuing through May 14, 2010, the *M/V Doric Glory's* oily water separator, a piece of equipment which is used to prevent oil pollution, was not operational. Approximately once a month during this time period, on the voyages between Jamaica and the United States, the engineering crews regularly discharged oil contaminated waste directly overboard.

STANSHIPS further admitted the engineering crews knowingly failed to maintain an accurate record regarding the illegal discharges of oil. Additionally, STANSHIPS admitted that the *M/V Doric Glory* had an oil leak in its stern tube, a problem known to the crew since at least the middle of April, 2010. The knowing discharge of a harmful quantity of oil from the *M/V Doric Glory* was not reported to the U. S. Coast Guard or National Response Center as is required, nor were the discharges recorded in the Oil Record Book.

This case was investigated criminally by the U. S. Coast Guard Criminal Investigative Services and was prosecuted by Assistant United States Attorney Dorothy Manning Taylor, and Senior Trial Attorney Richard Allen Udell with the Environmental Crimes Section, Department of Justice.

Source: U.S. Dept. of Justice

To stop oil from leaking from the stern tube seal assembly of a general cargo vessel, a Hydrex diver-technician team was mobilized to perform permanent repairs on the vessel during its scheduled stop in Gulfport, Mississippi, last month.

The team together with the diving equipment was mobilized from the Hydrex office in Tampa to set up a diving station at the berthing location. By the time all necessary preparations had been made, the team had been reinforced with additional technicians from the headquarters in Antwerp and was ready to assist the vessel as soon as it arrived at Gulfport.

The operation started with a thorough underwater inspection of the stern tube seal assembly, followed by the removal of the rope guard. This revealed a protection ring, which was removed to create more space for the renewal of the seals. Next the split ring was also disconnected and brought to the surface to be cleaned. A consequent inspection of the running surface of the stern tube seals showed that it was severely worn and no longer functional. After a discussion with all parties involved, it was decided to remove the spacer ring and create a new running area.

The Hydrex flexible mobdock was then installed around the stern tube seal assembly and a dry underwater environment was created in which the diver-technicians could remove the damaged seals one by one and replace them with new ones. After these were bonded the entire assembly was put together again and wear-down measurements were carried out with positive results. The flexible mobdock was then removed. Finally the protection ring and the rope guard were reinstalled, concluding the repair.

During the first inspection of the stern tube seal assembly it had become evident that the propeller blades of the vessel were damaged. The leading edges of all four blades were therefore grinded by the Hydrex divers to bring the propeller's efficiency back to its optimal condition.

The team worked in shifts to perform the stern tube seal repair within the shortest possible timeframe. By keeping his vessel out of drydock, a lot of time and money was saved for the customer.

SUBSEA SOLUTIONS ALLIANCE: Ship repair business for the member companies of the Subsea Solutions Alliance (SSA) is currently extremely busy. With a full complement of diver/technicians remaining busy throughout the globe, the SSA continues to remain the customer's choice for complex in-water equipment and vessel repair. Focusing on our core service activities of marine propulsion equipment repair and complex underwater steel repairs on various types of vessels throughout the world, the member companies of the SSA remain engaged in making the "impossible possible."

While the member companies continue to grow and train additional diver/technicians at its training centers throughout the world, the engineering departments within the SSA are working together with our Original Equipment Manufacturer (OEM) partners to create new methods of repair for their equipment. Applying the specialty knowledge of the SSA engineering team together with the OEM's engineering, research and development organizations, we continue to engineer unique methods of repair focused on speed, efficiency, cost and reliability. Keeping ships in service is the name of the game. Learning from each other the best practices and simple enhancements to make equipment more reliable and serviceable, our joint development teams are engaged on developing specialty equipment and procedures of maintenance and repair that will make drydock dependency a thing of the past.

SSA was very busy in April and May meeting the needs of the industry by performing multiple high value repairs in various ports around the world. The summary below illustrates just some of the major projects performed.

- Five Tunnel thrusters installations occurred- one each in Europe, Middle East, South Korea, Caribbean and Miami
- Five stern seals were overhauled/repared - South Africa (1), Caribbean (2), South America (1), and Europe (1)
- One Insert repair was performed in Newfoundland, Canada
- One CPP Propeller repair was performed in the Gulf of Mexico

HYDREX: Hydrex diver-technician team recently saved time and money for the owners of a general cargo vessel by replacing three stern tube seals, using one of the company's flexible mobdocks. This enabled the team to carry out the entire operation in-situ during the vessel's stop in Antwerp.

After the team and all the equipment had arrived at the vessel a diving team set up a work station to monitor all underwater activities. Next all quayside preparations were made for the main activity, which started immediately with the removal of the rope guard. This was followed by a thorough underwater inspection and shaft wear-down readings.

It was revealed that the leak was caused by a totally worn down oil seal and running area. A spacer ring was installed to push the housing of the seals further from the stern tube and over a new running area for the seals. Next the flexible mobdock was installed, creating a dry working environment for the divers to allow the entire stern tube assembly to be cleaned before the damaged seals were replaced. Subsequently all parts were reinstalled and secured. After a leakage test was successfully performed, the rope guard was welded on again.



# MERCURY Oil Leak Ties up Flinders Ship

January 19, 2010

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MARINE and Safety Tasmania has suspended Flinders Island vessel *Southern Condor* until the cause of an oil leak is fixed.

The suspension comes after the master of the vessel acknowledged to an Environment Protection Authority officer the vessel had a small oil leak.

The suspension leaves Southern Shipping without a ship, as its *Matthew Flinders* is under detention in Melbourne after having been found unseaworthy.

Southern Shipping director Geoffrey Gabriel was unable to be contacted yesterday.

Last week, the *Southern Condor* had its operations suspended when Southern Shipping failed to pay fees owing to Marine and Safety Tasmania. It has since paid the fees and resumed service.

MAST chief executive Colin Finch said Southern Shipping had been asked to repair the damaged stern tube seal which had allowed the oil to escape.

"The suspension lasts until the problem is remedied," Mr Finch said.

EPA director Warren Jones said the *Southern Condor* had been tied up at the Bridport jetty and a boom placed around the stern as a precautionary measure.

He said an EPA officer had found no evidence of oil on the beach or in the water.

"The master of the vessel acknowledged that there had been a small leak from the vessel's stern tube, small drips which when noticed had been collected," Mr Jones said.

The Liberals and Tasmanian Greens have criticised Infrastructure Minister Graeme Sturges over the Southern Shipping saga.

"Last week, Mr Sturges as the responsible minister allowed the *Southern Condor* to sail out of survey," Liberal MHA Peter Gutwein said.

"Now we find he has allowed it to be relicensed, only to have it run aground on a beach near Bridport spilling oil into the sea and causing a potentially serious environmental problem."

Greens MHA Kim Booth alleged the vessel had been leaking oil for months.

"This week's revelation from an unnamed crew member that the ongoing leak was being deliberately concealed required an urgent investigation by the Environmental Protection Authority," Mr Booth said.

Mr Sturges said he was seeking legal advice on whether last week's sailing was a breach of the Government's \$235,000-a-year contract with Southern Shipping.

**HYDREX:** When an oil leak prevented a 225 m bulker from continuing its sailing schedule, a Hydrex diver-technician team mobilized to Manila together with one of the company's flexible mobdocks to perform emergency underwater repairs at anchorage.

A typhoon was crossing over the Philippines at the time the team arrived and after preparations had been made the storm grew to a climax. Unfortunately this meant that the divers could only continue the underwater operation after a day, when the weather had improved slightly and full safety could be guaranteed for the divers.

Still under terrible sea conditions the rope guard was removed and an inspection revealed that a fishing net had been caught in the assembly and was tangled up around the entirety of the seals. A spacer ring was then installed to push the housing of the seals further from the stern tube and over a new running area for the seals. The flexible mobdock was then installed, creating a dry working environment for the divers at a depth of 12 m.

The net was then removed and the entire assembly was cleaned before the damaged seals were replaced one by one. The spacer ring that the team had installed earlier made sure that the new seals covered a different running area with no wear down.

Everything was then reassembled and secured with wire. After a leakage test was successfully performed, the rope guard was welded on again and anodes were installed around the area of the housing to provide additional protection for the stern tube seals.

The lightweight flexible mobdock packed in flight containers allowed for a very fast mobilization and a timely arrival of the team. Forced to halt the repair during the peak of the typhoon, the team worked through the rest of the storm to make sure that the delay for the customer was kept to an absolute minimum. Very strict safety measures were taken during the entire operation, as is the case with every job Hydrex performs. By creating a dry environment underwater, the divers were able to carry out any required work in-situ. This saved the owner the time and money which going to drydock would have entailed.

## **Canadian Ferry Spills Small Amount of Oil After Being Snagged by Crab-Trap Rope**

August 25, 2009

A small spill of oil from a BC Ferries ship off Canada has been contained, the company said. The 9,900-gt RORO *Northern Adventure* (built 2004) leaked 40 litres into the sea at Prince Rupert harbour over the weekend after it became trapped in a crab-trap rope which coiled around the port shaft. Staff immediately deployed inflatable booms and the vessel was towed by tug back to port. The ship had been making a routine journey without passengers about a quarter mile offshore to allow another BC vessel to access the terminal. Transport Canada is investigating the incident.

HYDREX: Recently Hydrex diver-technician teams performed two in-situ underwater stern tube seal repairs. One was on a 292 m container vessel that was berthed in New York with an oil leak and was not allowed to sail unless permanent repairs were carried out. The other repair was on the mechanical seal of a 150 m general cargo vessel in Lagos. It had a rope stuck in its seal assembly from which oil was leaking.

The repair in New York was performed with the use of the Hydrex flexible mobdock technique, which allows divers to create a dry environment around the stern tube seal assembly. This enables them to carry out any required work in-situ and underwater, but in a dry environment, saving the owner the time and money, which drydocking would entail. Meanwhile, the type of seal assembly on the general cargo vessel in Lagos allowed for the second repair to be carried out in the wet. This rare occasion gave the team the opportunity to mobilize even faster with only the irreducible minimum of equipment.

Because the US Coast Guard has very strict policies concerning environmental risks, they did not allow the container vessel to sail to a different location before the oil leak had been permanently fixed. To prevent any unnecessary additional loss of time, a diving team was mobilised to New York together with an Aegir Marine technician and all the required equipment. After a monitoring station had been set up on site, the team started with a full underwater inspection, which revealed that huge quantities of fishing line and nets around the assembly had caused the oil leak. The inspection also revealed that part of one of the propeller blades was also missing, causing it to lose its balance and its optimum efficiency.

Liasing with the Hydrex technical department in Antwerp, arrangements were made with a local service station to perform a propeller repair while the Hydrex diving team was working on the seal assembly. By cropping the opposite blade to exactly the same specifications as the worn blade, the propeller's performance was brought back to its optimum condition.

Meanwhile the Hydrex diving team installed the flexible mobdock around the seal assembly after removing the fishing lines. Next they established a communication line with the monitoring station. Three seals were then replaced one by one by new seals, which were prepared onshore by the Aegir Marine technician. The mobdock was then disassembled and after a successful pressure test the vessel could sail again, free of oil leaks.

When a general cargo vessel suffered damage to its stern tube seal, the owner asked Hydrex to assist the vessel in Lagos because a similar operation was performed on one of his other vessels and it was known that Hydrex could carry out the repair in-situ within a very short time frame. As the ship was equipped with a mechanical seal assembly there was no need to mobilise a flexible mobdock as the repair could be performed in the wet. This allowed the underwater team to arrive at the location at the same time as the vessel and only days after the enquiry was made. They immediately started making the necessary local preparations together with our local support base.

The repair started with the removal of the rope that had caused the oil leak. The seal assembly was then opened up and the two split rings were removed and taken to shore where they were cleaned and prepared for reinstallation. With the aid of special tools the spring unit was compressed and a small opening was created between the different parts of the assembly. The team could then remove the remains of the rope and clean the area. Next the spring unit was repositioned, completing the repair in less than a day. Oil pressure was then restored to the seal assembly and a successful pressure test was performed during the night. The next morning the rope guard was reinstalled and the team was ready to return to the Hydrex headquarters.

HYDREX: When oil started leaking from the stern tube seals of a 225 m bulker, Belgium's Hydrex organized the necessary repairs to be performed afloat after the vessel had been trimmed in Amsterdam, the Netherlands.

To allow the owner to maintain the ship's schedule, it was decided to make all preliminary preparations and have the assembled team on standby. This enabled Hydrex to mobilize immediately after the technical department received a call that the ship had finished unloading its cargo. While Hydrex's team was en route, the ship's crew trimmed the vessel and drained the oil from the stern tube seal assembly so that it was above water and ready to be serviced when our technicians arrived.

The first action the team took was to install scaffolding around the assembly to give easy access to the seals. The rope guard was then removed. This immediately revealed that a fishing net stuck around the liner had caused the damage to the seals that led to the leak. After disposing of the remains of the net, the assembly was opened and a full inspection of the liner and seal assembly was performed. This revealed the wear-down of the liner to be well within the limits so no additional repairs needed to be performed besides the replacement of the damaged seals.

In cooperation with an Aegir Marine technician the oil seal was replaced by a new one. It was then covered again by the corresponding housing ring and secured after which the assembly was filled with oil to start the leakage test. Next the two water seals were replaced and the entire housing was reassembled. To finish the leakage test the plugs in the housing rings were removed, revealing that the repair had been successful, replaced with new ones and secured. The rope guard could then be reinstalled and the scaffolding was disassembled, concluding the operation.

A spokesman for Hydrex said "We pride ourselves upon the flexibility that contributes to our reputation because we know how important it is for ship owners to have any repair work adapted to their specific needs. This flexibility in combination with the excellent communication and coordination between our technical department, our repair teams and the vessel's crew enabled us to perform the action much faster than planned within a very tight timeframe of only sixteen hours. This gave the customer the opportunity of keeping to the ship's unloading schedule and sailing on without any unnecessary delay".

When a 295 m container ship developed an oil leak from its stern tube seal assembly due to a fishing net Belgium's Hydrex mobilised a diver/technician team to Panama where underwater repairs were carried out using the Hydrex unique flexible mobdock technique.

Working closely together with a local support base, three seals type 950MK2 were replaced in one smooth operation while the vessel was anchored at the entrance to the Panama Canal. The new seals were prepared onshore by an Aegir Marine technician, brought inside the mobdock one by one and bonded. Corrosion on the running area of the seals prevented the new seals from completely closing off the inside of the ship, so the decision was made to remove the spacer ring. To achieve this, the assembly was put together again and disconnected from the stem tube flange after the flexible mobdock was uninstalled. The removed bolts were taken onshore where they were shortened so that they could be re-used afterwards. The entire assembly was then first pushed back, to allow the spacer ring to be removed, and was then repositioned closer to the stern tube flange and secured again with the adapted bolts. This adjustment brought the seals beyond the corroded area so that they closed off the inside of the vessel completely. Subsequently the seal assembly was refilled with oil and a static pressure test was performed, verifying the success of the repairs. The rope guard was then repositioned, completing the repair.

Hydrex's special lightweight equipment stored in our fast response centre at the company's headquarters in Antwerp allows Hydrex to mobilise to the location of the vessel almost immediately after Hydrex was contacted to perform the necessary repairs in-situ. Hydrex combine this facility with a worldwide network of local support bases established over the last 35 years, so that Hydrex can offer the best and fastest service to customers. In this specific case Hydrex gave the owner of the container vessel the opportunity to have the damaged stern tube seals on his vessel replaced without having to change its schedule to take it into drydock, saving him valuable time and money.

HYDREX: A 52,409 dwt bulk carrier suffering a leaking stern tube seal was recently assisted by a Hydrex diver/welder team which performed emergency underwater repairs in Panama using the facility of the company's flexible mobdock technique.

The vessel was berthed amidst the hustle and bustle of the entrance to the Panama Canal and the leak therefore had to be repaired as rapidly as possible. The Hydrex fast response centre is designed to handle emergencies like this within a very short time. Despite being involved in preparations for two large upcoming offshore projects a team of six diver/welders was instantly mobilized together with an Aegir Marine supervisor, a flexible mobdock and the rest of the equipment.

Immediately after their arrival at the location a monitoring station was set up next to the vessel to keep track of everything that would happen underwater during the operation which then started with a detailed preliminary inspection. This was followed by the removal of the rope guard by a local company under the supervision of one of the Hydrex technicians.

The mobdock was then installed around the stern tube seal assembly after which it was pressurized and inspected. Once the dry space was established, lights and CCTV were installed and a connection to the monitoring station was set up.

Working inside the mobdock as if they were working in the dry, the divers made a further inspection of the seal assembly and discovered that two of the water seals had been damaged. The vessel was only three years old and the damage had probably been caused by a fishing line or a similar object. In addition, as the oil seal was also showing wear, it was decided to replace it together with the two water seals.

On the shore three new seals, type 560cx were prepared by the Aegir Marine supervisor and then brought inside the mobdock to replace the old seals and to be bonded. The stern tube was subsequently refilled and a static pressure test was carried out with positive results. The flexible mobdock could then be removed and the rope guard was repositioned.

SubSea Solutions Newsletter "The Chronicles"

## **Seal Solutions for Pristine Waters: Seal Repairs in the Galapagos Islands**

June, 2008

When a small cruise vessel operating in the Galapagos Islands experienced outboard shaft seal problems, the experts at the Subsea Solutions Alliance were called into action. Prepared for the worst, the SSA dispatched equipment and certified seal service engineer / divers to support an in situ repair. In order to carry out the repairs without interruption of the vessel's cruise schedule, two 4 man teams mobilized from SSA offices in Miami Florida, Los Angeles California and Vancouver British Columbia to provide 24 hour, around the clock operation capacity. After flying through Guayaquil Ecuador to the Galapagos, the team completed the final News from the SubSea Solutions Alliance transportation leg to the vessel's anchorage via Zodiac inflatable tenders. Within ONE day of arrival on board, the team removed the rope guard, determined the source of the leakage, repaired the seal, pressure tested the system, witnessed a sea trial and re-installed the rope guard.

The vessel sailed on schedule without requiring the operator to find a dry dock and take the vessel out of service. Additionally, the most environmentally sensitive ecosystem in our world was saved from potential oil pollutants by the dive professionals of the Subsea Solutions Alliance.

## **Four Underwater Seal Repairs - Three Continents in Two Weeks**

May, 2008

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The SSA was put to the test in the month of May. With four underwater seal replacement repairs necessary throughout the world, the members of the SSA banded together to answer the call. Three (3) underwater seal replacements on three (3) different continents were performed simultaneously. With only a few days notice, SSA was able to dispatch equipment and a full contingent of divers to the remote port of Montevideo, Uruguay to perform an emergency seal replacement to a 4000 TEU container vessel with a 850 mm diameter seal. While at the same time, equipment and a team of divers was dispatched to Mallorca, Spain to attend a passenger vessel with a size 600 mm diameter seal just after completing a job in Durban, South Africa on a 8500 TEU container vessel with a size 1030 mm diameter seal.

Utilizing their unique Blohm and Voss Industries GmbH approved underwater repair process with their exclusively “fit for purpose” habitat designed to develop a climate controlled DRY environment around the defective seal, SSA bonded the seal to original factory specifications while working underwater thus providing a permanent repair for the vessel owner. Underwater repairs yet again demonstrate their value by keeping vessels in service with minimal impacts on schedule.

## **One Call and That’s All– Subsea Solutions Alliance Delivers**

When a vessel entering Vancouver this month with severe propeller damage combined with a leaking aft propeller shaft seal, the experts at SSA were called into action. While still at the anchorage, the propeller experts from All-Seas Enterprises in Vancouver mobilized the necessary resources to support the repair. Within a day, the severe bends in the propeller blades were removed and cracks repaired. Utilizing the cold straightening process under license from Subsea Propeller Inc, the team from All-Sea Enterprises was able to restore the propeller to its prior condition. Upon conclusion of the straightening process, the vessel was maneuvered into the port of Vancouver for an underwater replacement of it’s after propeller shaft seal. The team of experts from all members of the SSA performed the critical seal repairs and the vessel departed on its voyage. Sea trials were conducted by the owner and they were pleased to report that the vessel performance was restored to its original condition prior to the propeller damage.

**HYDREX:** When a 38,000 dwt bulk carrier suffered severe damage to her seal assembly Hydrex was asked to do the repairs and replace the aft seals using the flexible mobdock (mobile mini drydock) technique while the vessel was in Piombino, Italy.

The rope guard was missing from the seal assembly and some of the stern tube flange bolts were seriously damaged, while others had broken off. The flange ring had mostly been scraped off, presumably by the rope guard before it had become completely detached. There was also a gap between the stern tube and the flange. It was clearly a complicated repair but Hydrex's technical department worked out a procedure to carry out the work in-situ. Meanwhile, a technical diving team and the flexible mobdock, vital to the repair work, were mobilized from Antwerp to Piombino.

The gap between the stern tube and the flange was measured and these measurements were used to manufacture a specially-designed split ring (the push ring). This was used to push the flange back into position against the stern tube where it was secured with new, longer flange bolts. With this push ring in place, a distance ring was used to replace the spacer ring in the opening between the stern tube and the flange. At this point the flexible mobdock was installed around the mechanism.

The two water seals were renewed and bonded following standard procedure. The seal assembly was then pushed against the stern tube without the distance ring or the spacer ring to create a new running surface for the seals, and to create the extra space needed for replacing the oil seal, which was subsequently completed. An overnight leakage test was executed with positive results and the system was refilled with oil.

Dry-docking had initially appeared the only option for the ship owner. The stern tube seal assembly had sustained damage that seemed too extensive to repair underwater. Being accustomed to solving such problems, Hydrex worked out a procedure that enabled the diving team to carry out vital underwater repairs on the seal assembly, in the wet and after that install the mobdock, replace the seals and complete a full repair.



HYDREX: A 290 metre-long bulk carrier recently developed an oil leak in her stern tube seal assembly and required the replacement of three aft seals. The replacement operation was performed during February while the vessel was berthed in Amsterdam.

Hydrex was called out to do this work and a team was sent immediately to Amsterdam, where it was joined by a seal specialist from AEGIR-Marine, with whom Hydrex has a co-operation agreement covering underwater seal replacements. The team arrived at the location with a specially-designed mobdock (mobile mini drydock) necessary to complete the replacement operation.

The first step was a meeting between the vessel's owner, superintendent and the Hydrex team leader. Meanwhile, the rest of the diving team set up a workstation to monitor all underwater activities. This was followed by quayside preparations of the mobdock, which started immediately after the team leader completed the co-ordination meeting.

In-water, the Hydrex divers first took the shaft wear-down readings. When completed, the rope guard was removed and the seal assembly inspected. The assembly was found to be in good condition and the operation continued with the installation of the flexible mobdock, which was positioned, secured and pressurized. Subsequently the mobdock was inspected and equipped with the necessary equipment and life support systems.

Once a dry underwater environment had been created, the main operation began with the removal of the split ring (the part of the assembly keeping the first water seal in place). The seal assembly was then cleaned. While the supervisor checked and prepared the new replacement seals onshore, two diver-technicians opened up the seal assembly. The oil seal was put in place, bonded and equipped with seal springs. This same procedure was repeated on the two water seals, after which the system was reassembled and filled with oil. A pressure test was then carried out to a positive result. In the meantime, the seal manufacturer carried out a leakage test and checked the line connections. No oil leakage was found and a final wear-down measurement was taken before all bolts were secured with locking wire.

The flexible mobdock was removed and the rope guard re-positioned and secured by means of underwater welding. The Hydrex team headed back to Belgium after a smooth operation, which saved the vessel from going into drydock and, more importantly, from the substantial delays and expensive off-hire time this would have incurred.

HYDREX: A 112 m dive support vessel had divers in saturation onboard while operating in Denmark when the seals of the aft stern tube seal assembly needed to be replaced. Going to drydock was not a feasible option and Belgium's Hydrex was called to do the repairs in-situ with our flexible mobdock technology.

The underwater operation began by removing the rope guard from the assembly and shaft wear down readings were taken. The adapters were then put in place and the flexible habitat was positioned and secured over the stern tube seal assembly. The seal assembly was cleaned and two of the seals bonded. At this point the vessel had to move location. In this new position preparations were made for bonding the third seal.

When the last seal was complete the valves were inspected and the system refilled with oil. Since no leakage was detected, only a concluding wear down measurement needed to be taken before the flexible habitat was removed and all bolts secured. Finally the rope guard was repositioned and secured by means of underwater welding.

Thanks to Hydrex's fast response centre a diving team and all the equipment was mobilised the same day the call came in. The entire repair was carried out swiftly avoiding the requirement to drydock the vessel. As this would have meant breaking off the scheduled saturation diving operation earlier than planned, valuable time and money was saved for the owner by doing the repairs in-situ.

Meanwhile, while still under warranty, a three-month old, 260 m container ship developed an oil leak from its stern tube seal. Hydrex was called to do repairs in-situ in Pusan, South-Korea, using our special mobdock (mobile drydock) technology.

The first part of the job started with an inspection of the stern tube seal assembly. The rope guard was then dismantled and the flexible mobdock installed around the seal assembly, creating a dry environment to work in around the seal, underwater.

Next, all four seals were inspected. This revealed that the three water seals were still in excellent condition and only the oil seal had to be replaced. The cause of the leak, so soon after the newbuild phase, was that the oil seal had been running without sufficient lubricant.

The liner and its rings were then cleaned and the new seal was brought into the mobdock, positioned around the assembly and bonded. When the bonding was complete, the old seal was removed and the split ring with the net stopper was reassembled. All that remained to be done was for a leakage test to be performed. The completed test demonstrated that the repair had been successful. All the equipment was then removed, the flexible mobdock dismantled and the rope guard reinstalled, completing the operation.

SIMPLEX AMERICAS: Simplex Americas LLC was recently contracted by the owner of an Aframax crude tanker to renew both the aft and forward Simplex Compact ®SC2000 ® stern tube seals while the vessel was afloat. The work was carried out in a sheltered US Gulf port, after the vessel had completed discharge. The aft seal had sustained damage due to fishing line. The forward seal, although not leaking, was changed as well, since the vessel was already idle for the aft seal repair and it added no additional out of service time.

The job was planned and executed to allow the vessel to return to service with a minimal delay. The vessel was ballasted down by the bow, allowing the aft stern tube seal housing to clear the waterline by at least 0.5m. Utilising local support to minimize costs, pollution control measures were implemented, staging was erected in the seal area and a pontoon was used to provide a stable and safe working environment for the crew. The two service engineers, working both independently and at times together, disassembled both seals, and renewed the sealing rings in-situ, utilizing the unique high temperature bonding tools, along with the special factory supplied bonding adhesive. Once all five sealing rings (two forward and three aft) were renewed, the seal housings were reassembled, the stern tube was filled with oil, and the system was checked for leaks. The ship was able to return to service after only 39 consecutive hours of being out of service, including ballasting/deballasting time.

This was the 21st stern tube seal bonding job completed afloat by Simplex Americas LLC during 2007, allowing owners to renew their stern tube seals quickly and economically, on the spot, and without deviation. The various customer vessels included bulkers, tankers, and container ships.

# Fairplay Daily News

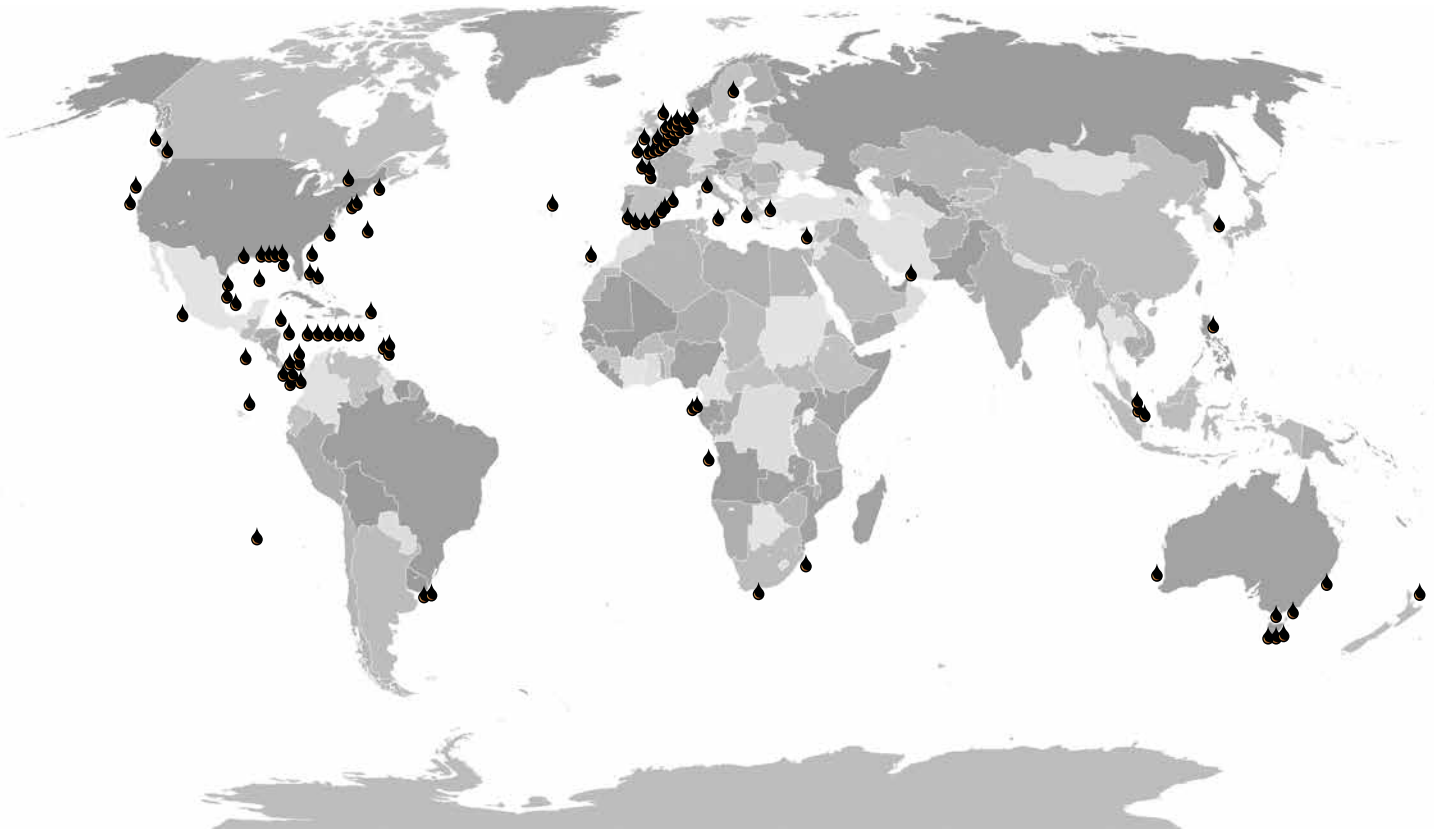
August 18, 2006

MIAMI, 18 August – Carnival Cruise Lines’ *Celebration* will require an unscheduled drydock to repair damage from this week’s ‘bottom touch’ off Nassau, Bahamas. Carnival confirmed yesterday that the five-day 21 August cruise will be cancelled as repairs are made, although no specifics on damage were revealed. One of the *Celebration*’s two propellers touched bottom when the ship attempted to dock in Nassau on Tuesday, affecting operations of one of the vessel’s two engines and causing 200 litres of lubricating oil to escape from the stern tube. After being cleared by the US Coast Guard on Wednesday night, the *Celebration* turned around as scheduled in Jacksonville, Florida yesterday, but was forced to cancel today’s Freeport call as a result of reduced speed. Passengers on the cruises whose itineraries have been curtailed have been awarded shipboard credit, while passengers on the cancelled 21 August voyage will receive a full refund and a 50% discount on a future cruise. However, the *Celebration* incident does not appear to have a material impact on Carnival earnings. As a Carnival spokesman told Fairplay: “Unless it was material, we would not issue a financial impact statement and I haven’t heard anything to suggest that we are planning a financial impact statement.”

<b>U.S. Coast Guard Detained Vessel</b>	
Ship Name:	Ship Type: Chemical Tanker
IMO No. 8025472	Flag: Bahamas
Date Detained: 04-Mar-2002	Class Society: Lloyd's Register of Shipping
Port: Houston, Texas	Company(s): Owners/Operators or Managers
Deficiencies: Code/Catagory	Ionia Management S.A.
2545 - Reports/analysis of non-conformities, etc.	Master and/or crew were not familiar with essential shipboard procedures relating to the prevention of pollution by oil in their failure to report the daily discharge of oil from the stern tubes of approximately 250-300 liters of oil.
1799 - Other (MARPOL Annex I)	Vessel did not provide immediate notification to the nearest coastal state of stern tube seal oil pollution.
1780 - Pollution report - annex I	The vessel failed to report a pollution incident without delay to the fullest extent possible in accordance with the provisions of Protocaol I to the present convention.
1499 - Other (Prop. & Aux. Machinery)	Stern tube is leaking oil at a rate of 250-300 liters per day due to improper seal.

# ACCIDENTAL OIL LEAKAGE REPORTED IN THE PRESS

Shaft Seals Repaired due to Oil Discharges (since 2006)



Types of Vessels					
Anchor Handling Vessel	1	Excavation Vessel	1	RORO	10
Bulker	9	Ferry	3	Tanker	14
Container Ship	15	General Cargo Ship	8	Unknown	43
Cruise Ship	5	Offshore Supply Vessel	2	Yacht	1
Dive Support Vessel	1	Pipe Laying Vessel	1		
Dredger	2	Research Vessel	1	<b>TOTAL</b>	<b>117</b>

Information collected by Thordon Bearings Inc.  
3225 Mainway, Burlington, Ontario L7M 1A6 Canada