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This technique enables to reinstall the propeller blades of an overhauled thruster inside the thruster tunnel after the unit has been secured or replace the blades or seals and perform repair work on a

specific part without removing the unit.

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

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HYDREX
UNDERWATER TECHNOLOGY

Permanent on-site pipe repairs around the world

Damaged or corroded overboard pipes can pose a serious risk to a ship's operations. When these pipes deteriorate, water ingress can occur, potentially leading to costly delays and unplanned drydock visits. Fortunately, replacing these pipes does not mean taking a vessel out of the water.

Our diver/technician teams regularly carry out permanent overboard pipe renewals while vessels remain af-



Welding work on overboard pipe in Dunkirk.



New pipe and surrounding shell plating on bulk carrier.



Severely corroded discharge pipe on crude oil tanker in Rotterdam.

loat. Using our class-approved repair procedures and specially designed cofferdams, we can replace damaged pipes and restore their integrity without the need for drydocking.

Four operations in France, the Netherlands, the United Arab Emirates and Panama demonstrate how we adapt our approach to different vessels and repair requirements.

Correcting a previous scrubber pipe repair in France

Our team was called to Dunkirk, France, to replace a scrubber overboard pipe on a 229-meter bulk carrier. A previous repair carried out by another company had left the pipe incorrectly installed, making a complete renewal necessary.

Following an inspection, it was determined that the entire pipe and flange needed to be replaced. Be-



Permanent in-water rudder repairs now possible without drydocking

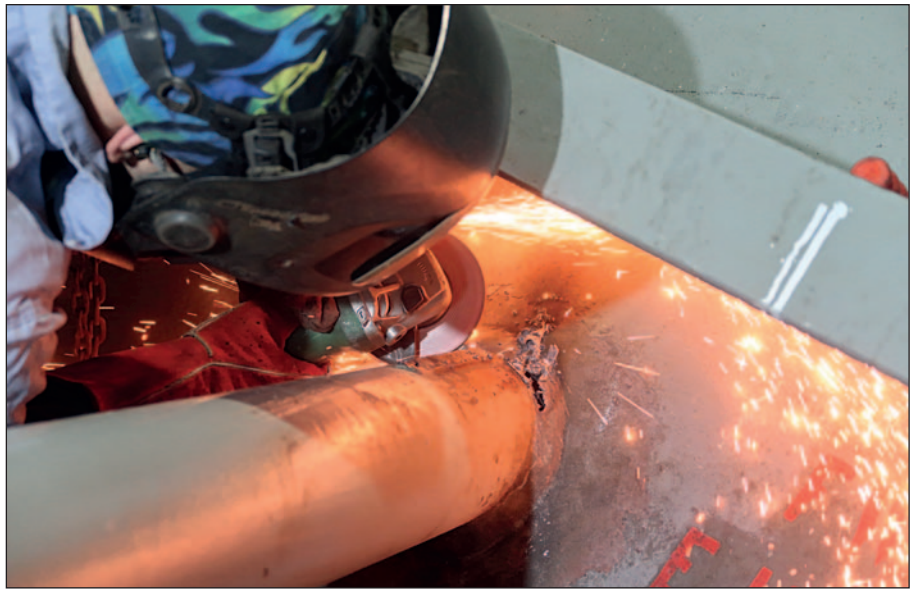


Hydrex has developed an entirely new method enabling permanent repairs of rudders without drydocking the ship. Permanent repairs were hitherto not possible and ships had to drydock in case a major defect was found. The newly designed equipment is light-weight and can be mobilized very rapidly in our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

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

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

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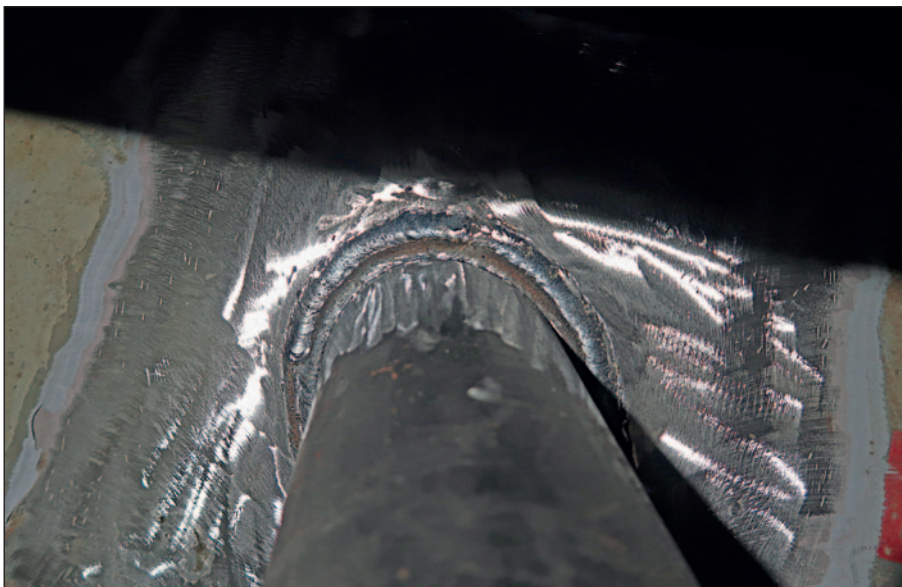
Removing the damaged pipe.



Hydrex certified welder preparing the new discharge pipe for installation.



Reinstallation of the new pipe in Rotterdam.



New pipe after full penetration weld.



NDT inspection by an independent inspector.



Welding work on new scrubber overboard pipe in Jebel Ali.

cause the existing pipe featured a cladding layer, it could not simply be welded directly into the existing hull opening. A new insert plate was therefore required.

Our technicians removed the defective pipe together with a section of surrounding shell plating. A new insert plate was fitted and welded into position, followed by the replacement pipe.

The internal surface of the new pipe was then protected with Ecospeed, a highly corrosion-resistant coating developed by our sister company, Subsea Industries. This provided additional protection for a component exposed to the demanding conditions of a scrubber discharge system.

The repair was successfully completed and accepted by the parties involved, providing a permanent solution to the incorrectly installed pipe.

From temporary to permanent repair in Rotterdam

In Rotterdam, the Netherlands, we were contacted to replace a damaged seawater overboard discharge pipe connected to the forward generator of a 249-meter crude oil tanker.

The vessel's crew had already carried out a temporary repair, but the damaged pipe needed to be replaced to restore the system's integrity.

Following an onboard inspection, our team prepared a new pipe and flange assembly. The existing damaged components were removed, and the replacement was accurately positioned and welded into the vessel's hull.





Cutting away the old overboard pipe.



The new pipe on the vehicle carrier was fitted with full penetration welding.



Cofferdam installed on cruise ship in Panama.

As the terminal did not permit work from the quay, our team used a workboat to carry out the underwater operations.

The complete renewal was carried out during the vessel's stay in Rotterdam. The finished installation passed its inspections and leak test, providing a permanent replacement for the temporary repair.

Scrubber pipe replacement in the United Arab Emirates

Another operation took place in Jebel Ali, United Arab Emirates, where a 199-meter vehicle carrier

required the renewal of a scrubber overboard pipe.

An earlier inspection had identified the need to replace the pipe. After examining the installation, our technicians determined that renewing both the pipe and its flange was the most suitable solution.

The old components were disconnected and removed. Particular attention was paid to preparing the existing hull opening, ensuring that the replacement pipe could be correctly positioned and welded into the shell plating. The new pipe was secured using a full penetration weld

from inside the vessel.

A successful leak test confirmed the integrity of the installation. The entire operation was completed during the vessel's port stay, eliminating the need for a separate drydock visit.

Overboard pipe renewal on cruise ship in Panama

One of our teams also mobilized to Panama to replace a damaged overboard pipe section on a 238-meter cruise ship.

The repair required the removal of the existing valve and affected pipe

section before a new section could be fitted and welded into position.

Following the successful installation, the supporting brackets were reinstated. The inside of the pipe was then coated and the valve and adjoining pipework were reassembled. After a successful leak test, our divers carried out a final underwater inspection.

The close cooperation between our technicians and the ship's crew allowed the different stages of the operation to be coordinated efficiently.

Permanent repairs carried out while afloat

Although each operation presented different challenges, all four repairs relied on our established procedures for carrying out pipe renewals while vessels remain afloat.

A key element of these operations is the use of an external cofferdam. Installed by our divers over the affected hull opening, it creates a dry working environment that enables technicians to remove damaged components and carry out conventional welding from inside the vessel.



Hydrex diver getting ready to dive in Panama.

Depending on the pipe configuration and condition of the surrounding steel, the replacement can be welded directly into the prepared hull opening or installed together with a new section of shell plating.

Avoiding costly downtime

These four operations demonstrate that even extensive overboard pipe replacements can be performed efficiently while a vessel remains afloat.

By combining experienced diver/technician teams, class-approved procedures and specialized underwater equipment, we can adapt our repair methods to a wide variety of pipe systems and vessel types.

Our technical department works closely with vessel crews and classification societies to plan and execute repairs with minimal disruption to the vessel's schedule.

Whether dealing with a deteriorated scrubber discharge pipe, a damaged seawater outlet or an incorrectly installed overboard connection, our teams can mobilize worldwide to carry out permanent repairs.

If your vessel requires an underwater pipe repair or replacement, contact us. We are available 24/7 to discuss the most suitable solution and arrange a rapid mobilization. ■

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The new pipe positioned and ready to be welded.



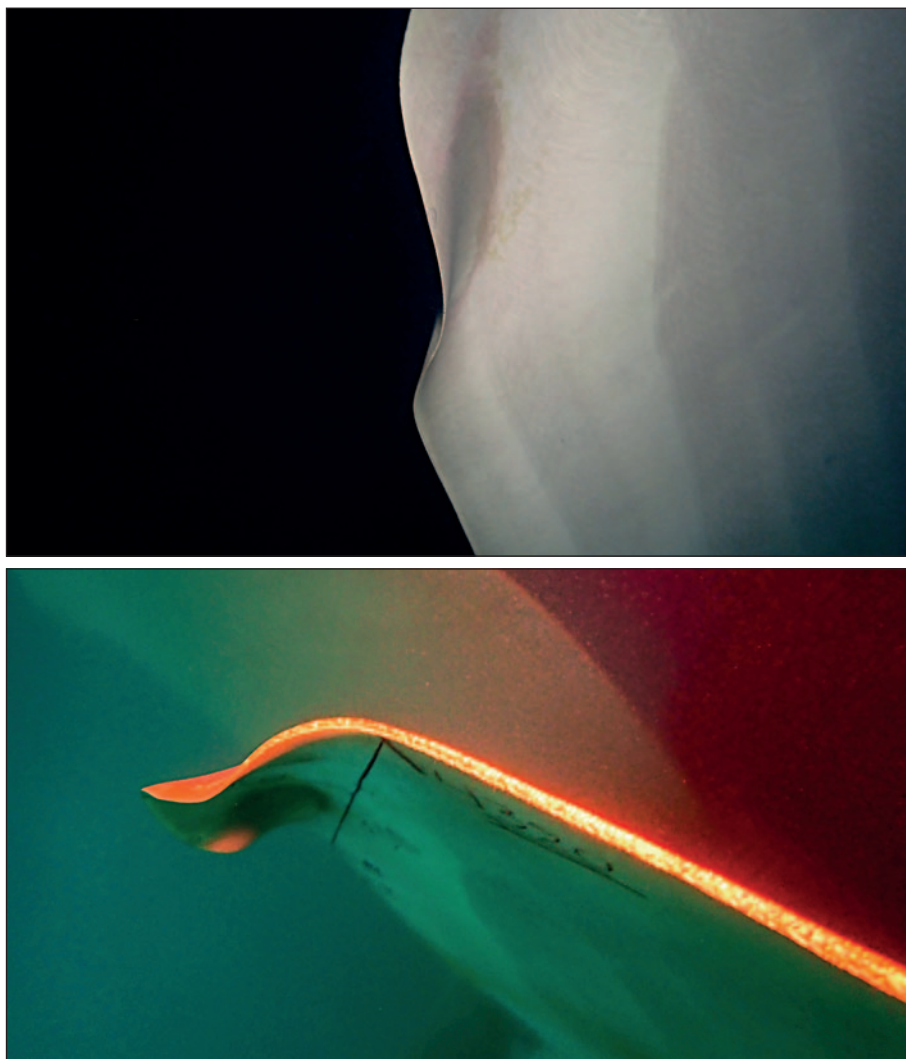
New overboard pipe after reinstallation of the brackets.

Three out of drydock underwater propeller repairs across Europe

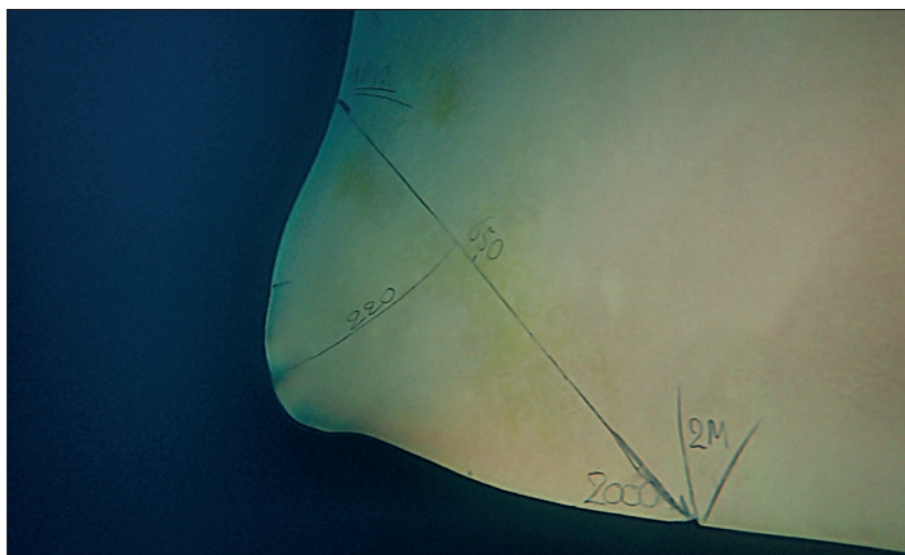
Damage to propeller blades can seriously affect a vessel's performance. Bent or broken blade tips can cause vibrations, reduce propulsion efficiency and even prevent a ship from continuing its voyage. Fortunately, even extensive damage can often be repaired while the vessel remains afloat, avoiding the need for a costly drydock visit.

Our diver/technician teams regularly carry out underwater propeller repairs using specially developed equipment and techniques. Depending on the extent of the damage, blades can be straightened back to their original shape or cropped to restore the propeller's balance and efficiency.

Three recent operations on a bulk carrier in Spain, a small cargo vessel in Portugal and a crude oil tanker in Denmark demonstrate these different approaches. The work ranged



Bent propeller blades on bulk carrier in Spain.

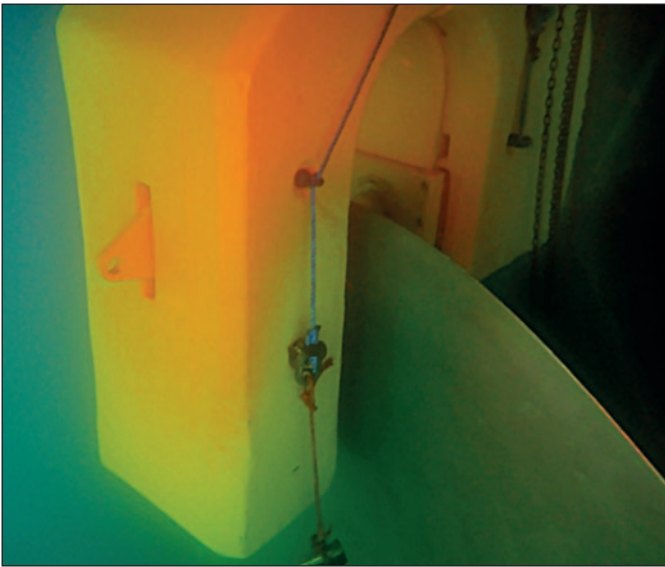


Markings on propeller blade to indicate the exact location where the straightening needed to happen.

from straightening four severely bent blades to cropping damaged sections and carefully balancing propellers with missing blade tips.

Four propeller blades straightened in Spain

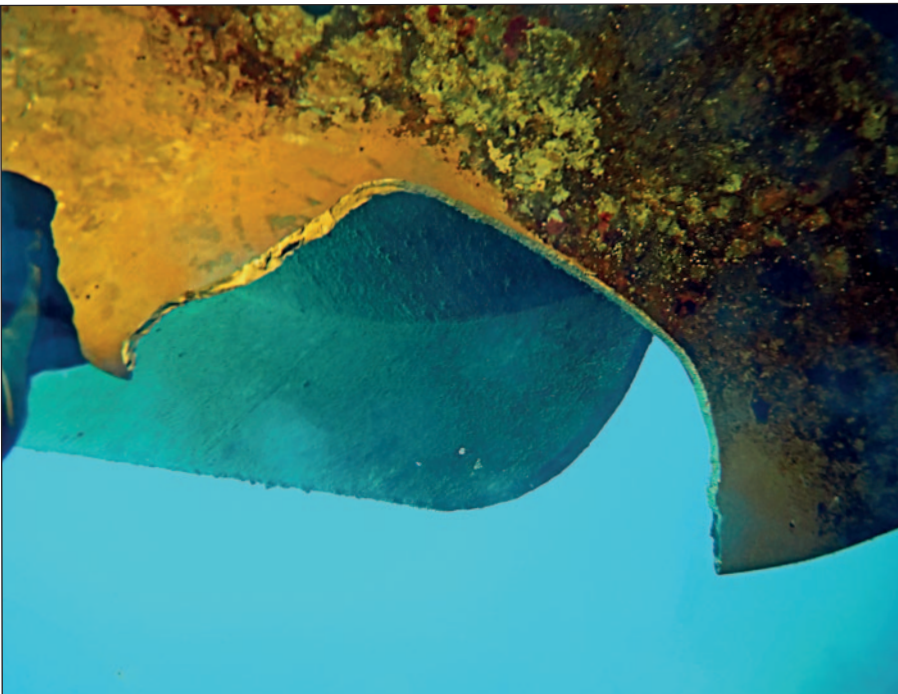
Our team was called to Gijón, Spain, to carry out a propeller repair on a 190-meter bulk carrier. An inspection revealed that all four blades of the vessel's fixed-pitch propeller had suffered significant bending damage.



Propeller cold straightening machine positioned over one of the bent blades.



Straightened propeller blade on bulk carrier in Spain.



One of the propeller blades of the cargo vessel in Portugal had lost a large chunk of its tip.

The tips were bent at angles ranging from 20 to 45 degrees. As no visible indications of cracking were found, underwater cold straightening was selected as a suitable repair method.

Our divers used our specially-developed cold straightening equipment to carefully bend the damaged sections back towards their original shape. This technique allows blades to be repaired without applying heat or removing the propeller from the vessel.

After all four blades had been straightened, the edges were ground smooth. A final inspection was carried out in the presence of a class



Propeller of cargo vessel before



...and after cleaning.



Cracks next to the missing blade tip.



Damaged blade after cropping.

representative, and the repair was approved.

The operation was successfully completed without removing the propeller or taking the vessel into drydock.

Propeller blade cropping and balancing in Portugal

A different approach was required during an operation in Caniçal, Madeira, where our team attended a 63-meter cargo vessel with a damaged four-bladed propeller.

One of the blades had lost a substantial section of its tip, measuring approximately 340 mm in length

and 180 mm in depth. A crack was also discovered next to the missing piece, making it necessary to remove the affected section.

Before the repair could begin, our divers had to clean the propeller, which was heavily covered with marine fouling, including barnacles, calcium deposits and slime. Once the surfaces were accessible, the damaged blade could be inspected and the cutting line accurately marked.

The affected blade was cropped along a 574 mm cutting line, removing both the damaged section and the adjacent crack.

Simply removing this material, however, would have left the propeller unbalanced. To compensate, our technicians cropped a corresponding section from the opposite blade, removing a similar amount of material.

The two remaining blades were undamaged and did not require modification.

The precisely planned cropping allowed the damaged section to be removed while maintaining the balance of the propeller.

Extensive propeller damage on tanker in Denmark

Another challenging operation took place in Skagen, Denmark, where our team was mobilized to inspect and repair the propeller of a 250-meter crude oil tanker.

All four blades had sustained severe damage. One blade tip was bent by more than 90 degrees, while the other three blades had sections of their tips missing.

Given the extent of the damage, blade cropping was selected as the repair approach rather than attempting to straighten the heavily deformed sections.



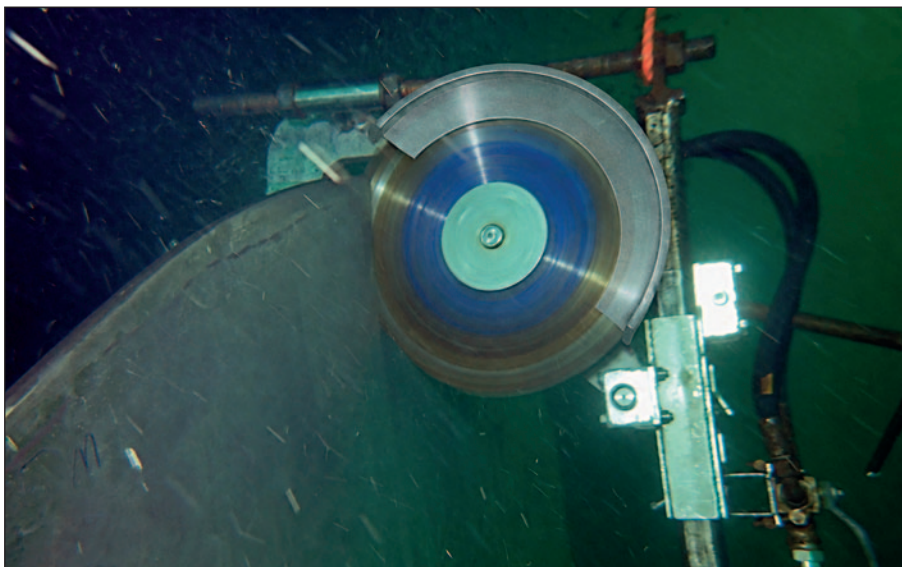
The opposite blade was also cropped to keep the propeller's balance.



Damaged propeller blade tip



...and bent blade on oil tanker in Denmark.



Cropping one of the propeller blades of the oil tanker.

Our team traveled from Antwerp to the vessel's location, where a workboat was required because the mooring position could only be reached from the water.

A detailed underwater inspection was carried out to measure the damaged areas and determine the appropriate cropping dimensions.

The repair plan involved removing corresponding sections from opposite blades to maintain the propeller's balance. Measurements were taken from the blade roots along the leading and trailing edges, allowing the cutting lines to be established accurately.

The resulting cropping plan accounted for the different damage patterns

on the four blades, with matching dimensions established for each opposing pair.

The operation illustrates the importance of accurate measurements and careful planning when dealing with extensive damage across an entire propeller. Rather than treating each blade separately, the repair approach must consider the propeller as a complete system.

Choosing the right underwater repair method

The three operations in this article demonstrate how our experience and equipment allow us to address a wide range of propeller damage, from bent blade tips to extensive material loss.

Accurate measurements are essential in every scenario. An incorrectly executed repair can leave a propeller unbalanced, resulting in vibrations and reduced propulsion efficiency.

By combining our underwater experience with specialized tools and technical expertise, we can carry out these operations directly on the vessel while it remains afloat. This helps shipowners restore propulsion performance as efficiently as possible while minimizing downtime, and avoiding unnecessary drydock visits.

If your vessel suffers propeller damage, do not hesitate to contact us. We are available 24/7 to discuss the most suitable repair solution and arrange a rapid mobilization. ■

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