

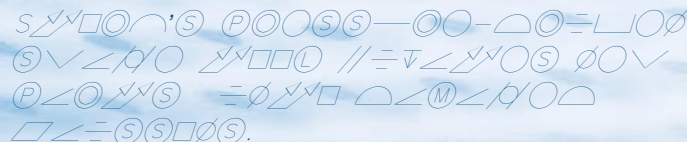


Critical to an asset's operations, caissons can face challenges from constant water exposure, which leads to stress, fatigue, increased corrosion and failure through cracking and wall defects. Stork offers more than 20 years of experience in delivering safe, reliable and cost-effective caisson management solutions throughout the UK Continental Shelf. Stork has a long track record of successfully delivering a holistic approach, from a project's commencement to its completion. As caisson condition continuously deteriorates in an aging asset, Stork offers a full-service and a fully in-house solution to reinstate caisson structural integrity.

CUTTING-EDGE REPAIR TOOLING

In the past, supplies related to caisson repairs have been difficult to obtain in the supply chain. However, Stork has brought an integrated, state-of-the-art solution to the marketplace. Through significant research, investment and resources, Stork has developed swage repair tooling, which has been manufactured locally and is fully DNV approved. Furthermore, full Finite Element Analysis (FEA) testing and analysis results are available to further demonstrate the proven repair solution. Stork's unique swaging technology delivers a complete caisson management package: Assess, Inspect & Repair (A.I.R.).

- **ASSESS:** Starting with a full assessment, Stork's in-house integrity engineers provide data-driven integrity assessments, prioritization and planning packages to meet the needs of the specific client. Fully assessing the caissons' history, the engineering team will define what, when and where inspections should take place.
- **INSPECT:** the inspection phase then commences with an initial camera inspection, followed by high-pressure cleaning and additional camera surveys. Finally, ultrasonic thickness (Ut) measurements are taken.
- **REPAIR:** Stork's repair offerings ensure full caisson integrity can be restored in the most optimal and cost-effective way. If required, Stork's experienced team can carry out the repair, utilizing the new swage repair tooling.



STORK EXCELS AT CAISSON MANAGEMENT

STORK SWAGE REPAIR SOLUTION **独特的沉箱修理技术**
Innovation

- Improved swage technology through forging
- Cost reduction for required liners

Assurance

- Independently assessed
- risk-based inspection planning and implementation

features

- Improved efficiency of swage: effectively swage a range of caisson thicknesses without needing to vary liner section thickness and grade
- pressure-driven, retractable centralizers: the tool is fully concentric with the liner throughout swaging
- Both digital and manual monitoring and tracking of pressure/volume: this controls the swage quality

safety

- fully function- and load-tested
- Approved by accredited registrar: dnV-GI

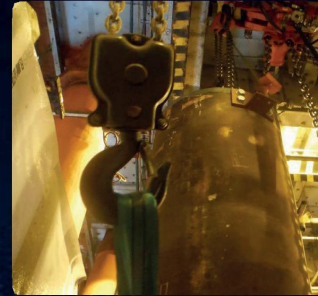
knowledge

- front-end engineering fEA was performed through optimus (Aberdeen) Ltd. and was based on common north Sea caisson sizes from a range of 20" - 36" proven track record in the management of caisson repairs

Benefits

- fast and effective repair method
- Multi-disciplined team, reducing personnel on board, while delivering to the highest quality standard
- Availability of tool for the work scope can be controlled in-house
- full connection strength of each swage repair proven by manual and fEA calculations
- Competitive, low-cost solution
- Strong hSEQ culture ensures safe working practices
- Environmentally friendly and pollution-free
- Single interface and overall cost reduction

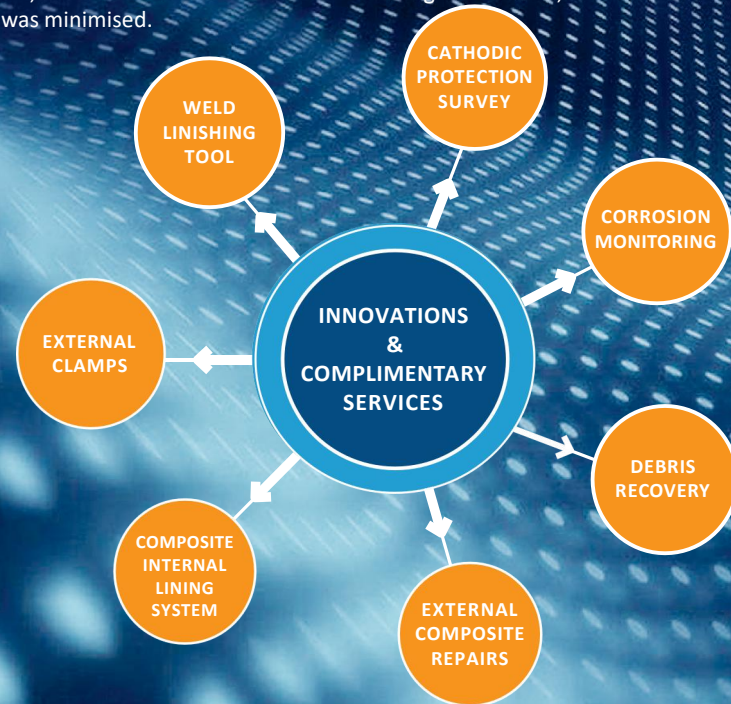




WORKSCOPE: Stork was contracted by a major oil and gas operator to deliver a full caisson repair solution to an installation situated within the UKCS. The workscope required onshore fabrication of the liners, weld alignment clamps, ILB & ELP'S, with Stork delivering the full lift plan and weld procedure for the rigging and lifting of the liners offshore. Swaging of the steel liners to the damaged areas was carried out to complete the repair. Throughout the workscope, Stork also carried out a visual camera inspection of the internal liners, upper and lower swages.

SOLUTION: A fabrication firm was contracted to manufacture 3 steel liners and all associated equipment required to complete the workscope. Stork mobilised a 6-man, multi-disciplined team to install the liners into the caisson. During the process, the team welded the liner together in 3 metre sections, and project managed the contracted firm to complete the swaging of the newly installed liners into the damaged zones of the caisson.

RESULTS & BENEFITS: Stork's work was completed within schedule and on budget, whilst adhering to the client's standards. The success of this work scope ensured Stork secured more caisson repair work on additional installations for the same client. Stork's highly skilled, multi-disciplined teams ensured efficient project delivery. The inspection allowed for an accurate picture on the integrity of the caisson and played an important role in supporting the client's structural integrity programme. Overall, due to Stork's dedicated Caisson Management team, the number of contractors used on the work scope was minimised.



REACH BEYOND ZERO

Stork is dedicated to being recognised as an industry leader in HSEQ; by our employees, clients and industry peers. REACH Beyond Zero, our value driven HSEQ engagement programme, will help us to achieve this goal.

REACH Beyond Zero is our HSEQ vision, to engage all Stork employees to challenge themselves, to think and do more to improve our HSEQ culture and performance. As an organisation we REACH Beyond Zero by functioning as one team with shared values, driving action to transform our HSEQ culture and performance. REACH Beyond Zero is built on five core values, which we seek to demonstrate at every level of our organisation.

The values are:

VALUE

VISIBILITY - acting as active champions of the REACH Beyond Zero values

AUTHENTICITY - demonstrating personal commitment through action

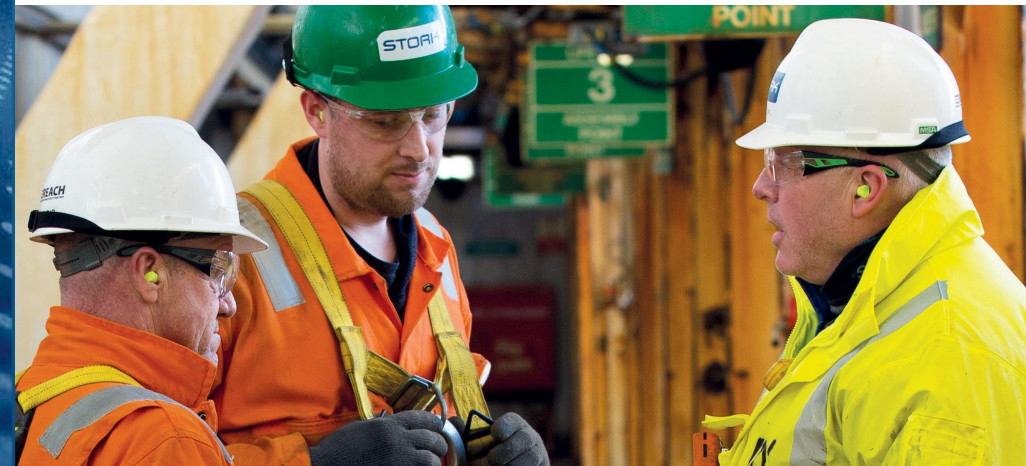
LEADERSHIP - taking personal ownership and responsibility for HSEQ in the workplace

UNDERSTANDING - understanding our HSEQ challenges and contributing to improvements

ENGAGEMENT - feeling empowered to intervene when a situation appears unsafe

- VISIBILITY
- AUTHENTICITY
- LEADERSHIP
- UNDERSTANDING
- ENGAGEMENT

Visit: www.stork.com/REACHBeyondZero for more information.



CAISSON CLEANING & INSPECTION

CASE STUDY: OFFSHORE PLATFORM, MAJOR OPERATOR, UKCS

沉箱清洗和检查案例 (包括高压清洗、远程视觉检查、全部长度方向超声壁厚制图)

Workscope

Stork was contracted by a major Operator to deliver a full caisson cleaning and inspection workscope on a platform in the UKCS. The workscope required Stork to deliver bespoke **Remote Visual Inspection (RVI) and Ultrasonic Wall Thickness Mapping**.

Solution

First, Stork used High Pressure (HP) Water Jetting to remove any marine growth and scale build-up. Secondly, Stork conducted a Visual Inspection of the entire caisson using its advanced inspection technology.

The team then used Ultrasonic Wall Thickness Mapping to **measure wall thickness along the full length of the caisson**, including the dry section using a specialist water flow probe.

As a result, Stork noted numerous through wall features and recommended future inspection requirements and remedial actions.

Results & benefits

The client required a quick turnaround on the workscope. Stork delivered an interim report in just two days, well ahead of the usual eight to ten day timeframe for report completion.

The inspection provided an accurate picture on the integrity of the caisson and played an important role in supporting the client's structural integrity programme.

The project was delivered ahead of schedule, on budget and without any LTIs.



Project Information

When: July 2015

Location: North Sea Platform

Workscope

③ Caisson Cleaning & Full Inspection

Equipment:

③ High Pressure Water Jetting, Remote Visual Inspection, Ultrasonic Wall Thickness Mapping (wet and dry)

Time frame:

③ 2 days (instead of typical 8 - 10 days)

仅用两天时间，完成所有工作

Safety:

③ Project delivered without incident