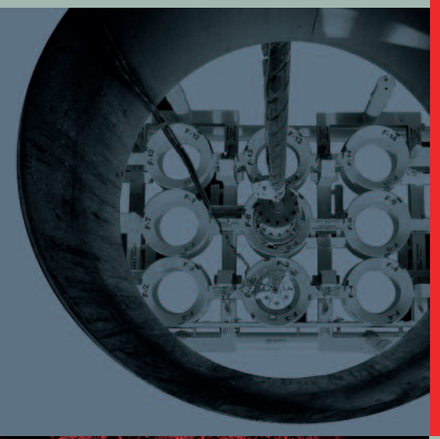
claxton®

MAKING STRUCTURES HAPPEN.

Deep experience combined with world-class design and project delivery mean you can trust Claxton to make your offshore structures happen.

an ACTEON company

MAKE IT HAPPEN.



“CLAXTON HAS WORKED TOGETHER WITH OUR CLIENTS TO INSTALL OVER 4,800 CONDUCTOR GUIDE CENTRALIZERS AND OVER 55 MAJOR PRE-DRILLED DEVELOPMENTS HAVE BENEFITED FROM CLAXTON DESIGNED – AND INSTALLED – DRILLING TEMPLATES.”

Our promise to you is that Claxton will make it happen for your project. From fitting an additional slot to your platform, to a structural centralizer or complete replacement conductor guide array, our team will do everything we can to ensure your project is both successful and safe.

Claxton has worked together with our clients to install over 4,800 conductor guide centralizers and over 55 major pre-drilled developments have benefited from Claxton designed – and installed – drilling templates. Complementing this innate understanding of structural issues involving conductors, our in-house design and R&D teams have delivered replacement conductor guides and guide arrays that significantly extend the life of operator’s assets. See more about this capability by visiting our website at **www.claxtonengineering.com/guides**

Thank you for taking the time to review our services and read this brochure – we hope you’ll find it useful and the whole Claxton team is looking forward to making your project happen very soon.

Laura Claxton
Managing Director

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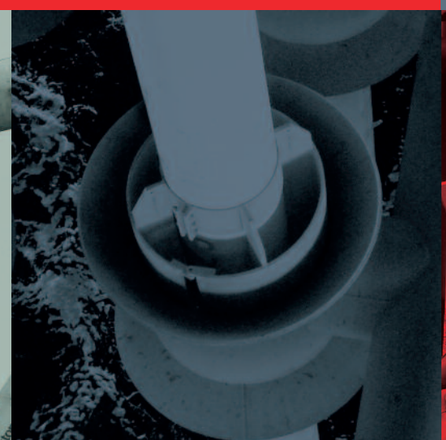
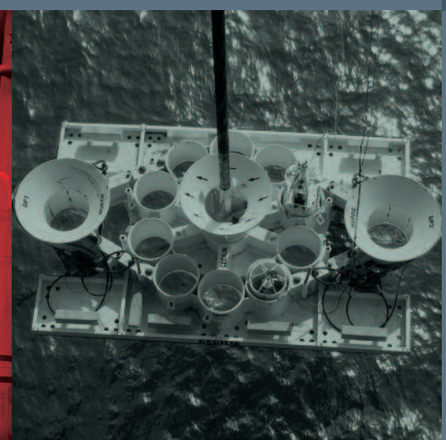
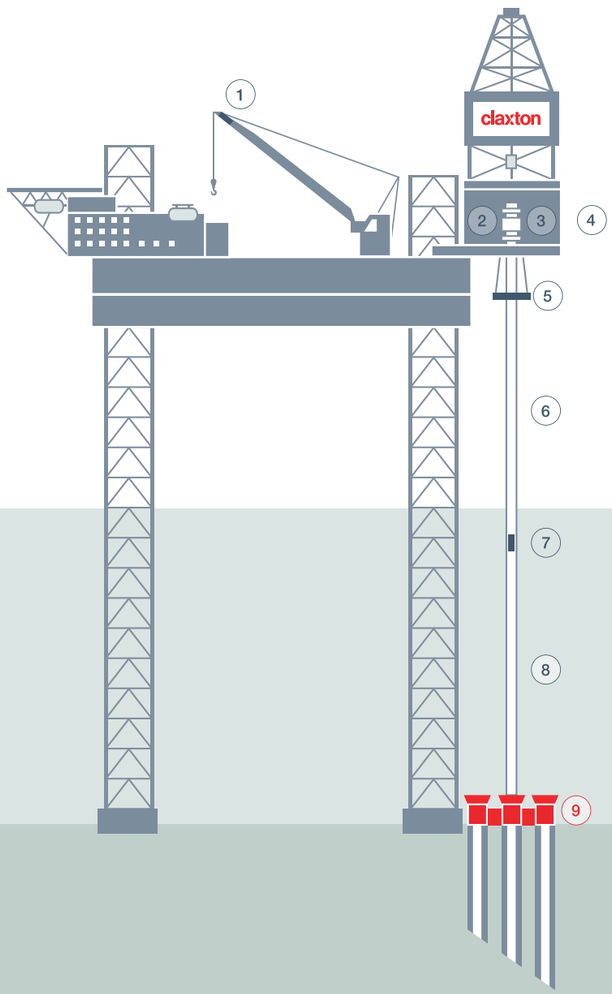




YOUR PROJECT NEEDS TO DELIVER.

WE'LL MAKE IT HAPPEN.

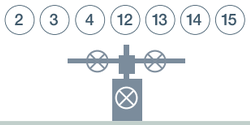
OUR SERVICES



OFFSHORE OPERATIONS

Since 1985, we've worked closely with our clients to make their projects happen. We believe in the sort of service you expect from a family business and back that up with a willingness and ability to solve operating challenges – safely and reliably – at pace.

This brochure is just a small example of what Claxton can do to make your projects happen. As always, we look forward to hearing from you soon.



ONSHORE OPERATIONS

1. Crane camera systems
2. Wellhead design/supply
3. Cold cutting
4. Equipment rental
5. Tension rings & tension systems
6. Drilling riser system supply
7. Subsea/downhole cameras
8. Tieback engineering
9. Drilling templates
10. Subsea well abandonment
11. Protective structures
12. Wellhead maintenance
13. Hot tapping
14. Equipment repair and refurb
15. Wellhead refurb/replacement
16. Cellar deck centralizers
17. Decommissioning & abandonment
18. Conductor guide centralizers
19. Slot/conductor recovery
20. Cement top up
21. Abrasive cutting
22. Internal centralizers

CENTRALIZERS FROM CLAXTON

Operating at the critical interface between the well conductor and the platform structure – where the forces imposed can be severe – centralizers provide vital ‘front line’ conductor integrity.

Over 4,800 Claxton conductor guide centralizers are in active use on platforms across the globe. Ranging from robust ‘new build’ designs through to retrofit models to extend asset life, our centralizers provide the strength and support needed to secure your conductors – assuring maximum integrity throughout the life of the conductor. From the cellar deck through to subsea guides, our centralizer designs and our installation processes are field-proven.

GLOBAL UNDERSTANDING

Claxton centralizers are used in projects around the world, from harsh environments like the UK North Sea to low-load applications in the Far East. In all applications Claxton centralizers can demonstrate a rugged, fit-for-purpose design that saves operational time and costs.

DESIGNED TO DELIVER

Using our extensive in-house design and R&D engineering resource, Claxton offers patented centralizer designs – all of which have been engineered to provide rugged performance and safe, efficient installation. Our desire to continuously improve our centralizers includes pioneering research into engineering polymers and new manufacturing techniques to continually optimise costs and performance for our clients.

STRENGTH IN NUMBERS

Being part of the Acteon group of subsea services business, Claxton can call on the skills of our sister companies – notably 2H Offshore, one of the world’s leading riser and conductor analysis houses. This joined up capability means we can handle your centralizer project end-to-end. This approach also ring-fences the conductor analysis from being too ‘led’ by design and gives an extra level of technical review.

CLAXTON CENTRALIZERS AT A GLANCE

Naturally, centralization requirements vary in line with applications and loadings. Designs will need to adjust not only to the geometry of the guides and conductor sizes but also to the specific loads and maximum clearance allowance based on the riser analysis.

Claxton supplies multiple sub-designs depending on the level at which they are located on the conductor and the time of installation. The centralizers types Claxton supplies are listed below.

Broadly speaking however, centralizers come in two main configurations, depending on the application:

FIXED

Reducing radial clearance between the conductors and their guides for new installations.

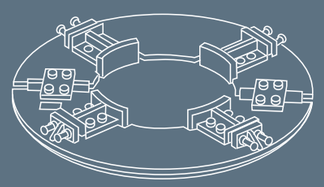
ADJUSTABLE

Adjusted when fitted to give minimum radial clearance limiting riser movement to minimum as well as impact loads.

CELLAR DECK

Installed at the cellar deck to secure the uppermost section of the conductor.

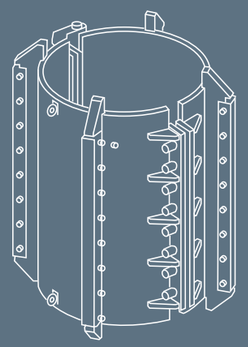
See page 8.



FIXED BLADE

Installed in subsea and splash zone guides.

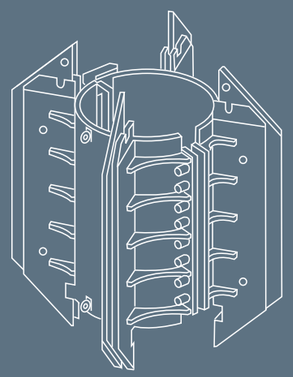
See page 10.



ADJUSTABLE

Typically installed in the splash zone level. Shim type, remotely operated.

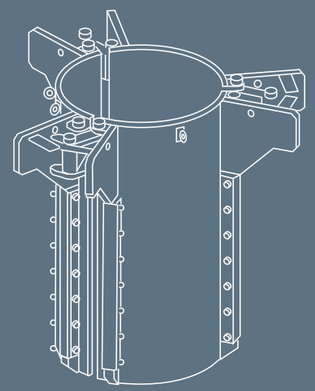
See page 12.



RETROFIT

Installed in subsea and splash zone guides when original centralizers have reached the end of their design life, in the event centralizers were not installed with the conductors themselves, or when conductors are driven.

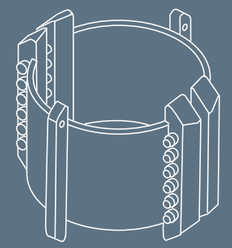
See page 14.



INTERNAL

Centralization for casing strings to prevent eccentricity and add structural support not offered by bow-type centralizers.

See page 16.



BESPOKE

For non-standard applications or loadings.

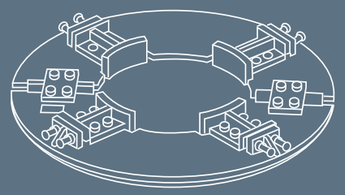
See page 17.

CELLAR DECK CENTRALIZERS

CELLAR DECK CENTRALIZERS

Adjustable centralizer installed at the cellar deck level to secure conductor at the uppermost level.

Application loading
Typically 2-7 tonnes.



Cellar deck centralizers consist of two halves that clamp to the guide or to the deck structure. The method of interface depends on the conductor guide type. There are four main types, each requiring slightly different designs:

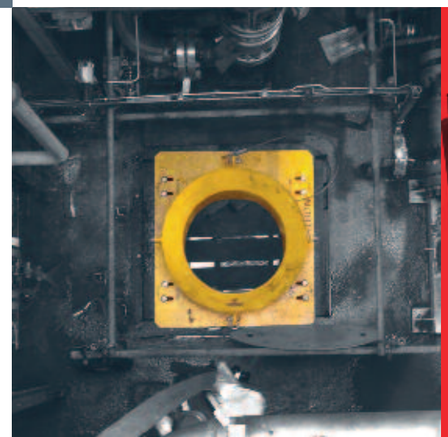
- **Internal**
  The centralizer is fitted inside a guide can
- **External**
  The centralizer is fitted around a guide can
- **External Cone**
  The centralizer is fitted onto the cone of a guide
- **Rectangular**
  The centralizer is fitted directly into an opening in the deck structure.

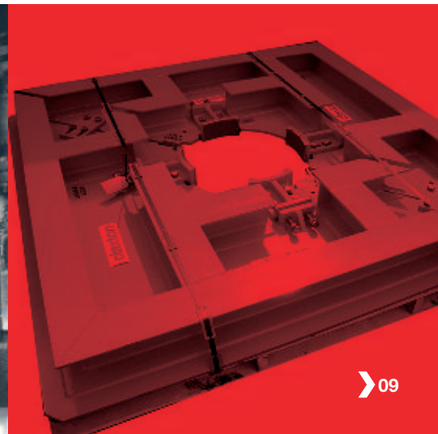
Critical stability

The primary purpose of this type of centralizer is to prevent excessive flow line movement and, in general, its form is a hole cover clamped to the guide using adjuster shoes with a moulded polyurethane layer to ‘cushion’ the interface with the conductor and prevent wear.

Application loading

The clearance is adjusted to a minimum (some clearance is required for riser axial expansion and movement). Typical low lateral loads of 2-7 tonnes although Claxton has supplied units capable of withstanding up to 26 tonnes of lateral load.



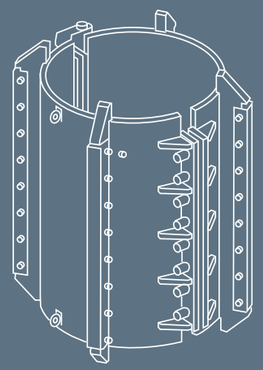


CONDUCTOR GUIDE CENTRALIZERS (FIXED)

CONDUCTOR GUIDE CENTRALIZERS (FIXED)

Structural fixed blade centralizer installed within a platform's subsea guides and, in some cases, may also be used at splash zone level when a tight fit is not required.

Application loading
Typically 20-50 tonnes.



This type of centralizer consists of a hinged design constructed in two halves with two bolting flanges. The design can include 'bumpers' to prevent metal to metal contact. These bumpers are steel inserts coated with a polyurethane elastomer which is tough, abrasion resistant, durable and resistant to UV and ozone.

The size of this type of centralizer will vary according to the configuration of the conductor and associated guides. The length is also variable depending on guide's length and tally tolerance.

Application loading

Loads vary depending on the conditions but typically will range from medium to high lateral loads (20-50 tonnes).

Failsafe assurance

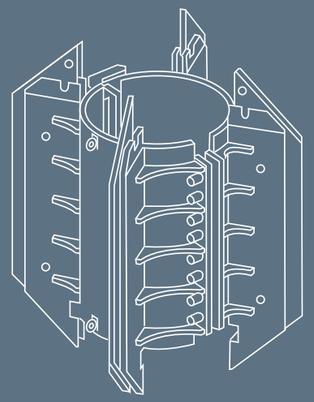
To provide additional assurance and failure protection, this type of centralizer is normally supplied with a thrust collar. This is a clamp that is installed directly under the centralizer as contingency for fatigue on the fasteners of the centralizer. The thrust collar, with a smaller diameter than the centralizer and not in contact with the guides, is not subjected to environmental loading.

CONDUCTOR GUIDE CENTRALIZERS (ADJUSTABLE)

CONDUCTOR GUIDE CENTRALIZERS (ADJUSTABLE)

Structural adjustable centralizers are typically fitted at the splash zone level where lateral loads are higher and tighter tolerances are required. Adjustable blades can open and retract to minimise clearance between the guide and the conductor.

Application loading
Typically 40-60 tonnes.



When to use an adjustable blade design

When the maximum allowable clearance is a value below that achievable by a fixed blade design, an adjustable mechanism is required to reduce the clearance after installation.

There are two main types of adjustable centralizers:

• Remotely adjustable centralizer

The centralizers are hinged designs constructed in two halves with two bolting flanges, containing two sets of adjustable blades per half. The blades are activated by a deployment ring that uses hydraulic cylinders to activate the adjusting mechanism. The adjustment is carried out remotely – enhancing operational safety.

• Shim type adjustable centralizer

In the same manner as the remotely adjustable design mentioned above, shim type adjustable centralizers are of a hinged design constructed from two halves with bolting flanges for easy installation around casing. The blades on the design are adjustable and are kept to the required extension with the installation of nylon shims behind the blades. The adjustment is carried out by rope access personnel.

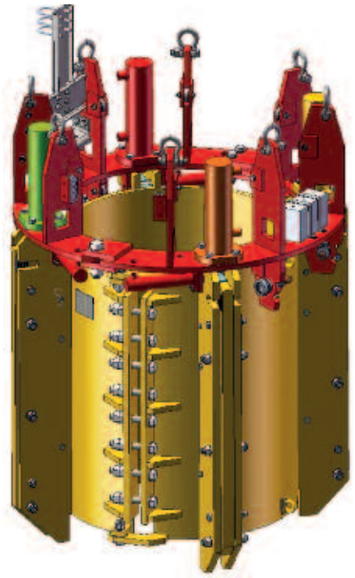
When using this type of centralizer, to allow space for the adjusting mechanism, a minimum radial clearance of 5" is required between the conductor and the guide.

Application loading

Loads vary depending on the conditions but typically range from medium to high lateral loads (40-60 tonnes).

Failsafe assurance

To provide additional assurance and failure protection, this type of centralizer is normally supplied with a thrust collar. This is a clamp that is installed directly under the centralizer as contingency for fatigue on the fasteners of the centralizer. The thrust collar, with a smaller diameter than the centralizer and not in contact with the guides, is not subjected to environmental loading.

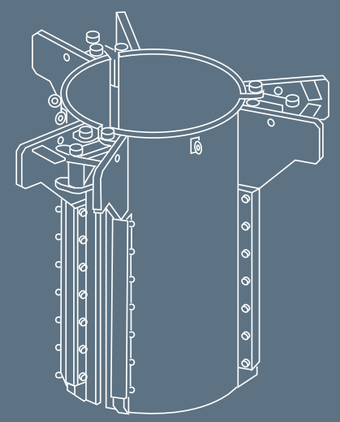


RETROFIT CENTRALIZERS

RETROFIT CENTRALIZERS

Retrofit centralizers are fitted between the conductor and the guide after the conductor is already in place. These units can be fitted at the splash zone level and subsea guides.

Application loading
Typically 20-50 tonnes.



When to use retrofit centralizers

- Where there are doubts about accurate conductor space-out during installation
- Where conductors are driven
- When centralizers were not installed in the conductor guides at the point of installation
- To provide centralization between the guide and a previously installed centralization has failed.

For the first three applications above, the centralizer typically comprises of a segmented central can – usually three segments – held together by hinges. Fins are mounted on the segments to provide the required clearance in the guide and extensions of these fins land on the guide upper cone to support the centralizer in place. The mechanism can be completely opened to fit around the conductor and has another setting to allow the centralizer to be run over connectors by the use of retainer pins. Once the centralizer has reached the guide, these pins are retrieved and the centralizer mechanism wraps around the conductor.

When the centralizer needs to be fitted between the guide and a previously installed centralizer, Claxton can provide a segment type retrofit centralizer which consists of two identical segments each including two adjustable blades and installed in place with the help of rope access personnel at the splash zone level.

Application loading

Loadings on this type of centralizer vary according to their location on the conductor and tend to be highest in the splash zone.

LEARN MORE

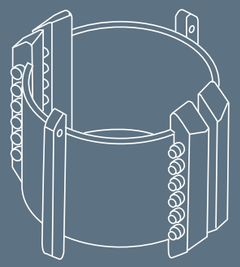
More information on this application can be found in a case study on page 22.

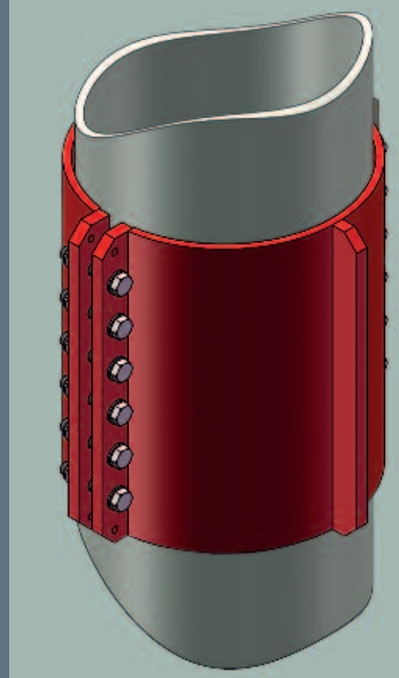
INTERNAL CENTRALIZERS

INTERNAL CENTRALIZERS

These are structural centralizers that are run on the internal strings where the standard cementing (bow-type) centralizer is not adequate as indicated by the riser and completion analysis.

Application loading
Radial 5-10 tonnes
Lateral 10-20 tonnes.





Our internal centralizers are constructed in two halves, each half with two joining flanges for easy installation around plain casing. The design considers the effect of test pressure in the inner casing (maximum and minimum pressure the unit will be subjected to as well as the medium).

When to use internal centralizers

This type of centralizer is required when there are concerns over the structural integrity of the inner strings and when the analysis shows risk of buckling.

Application loadings

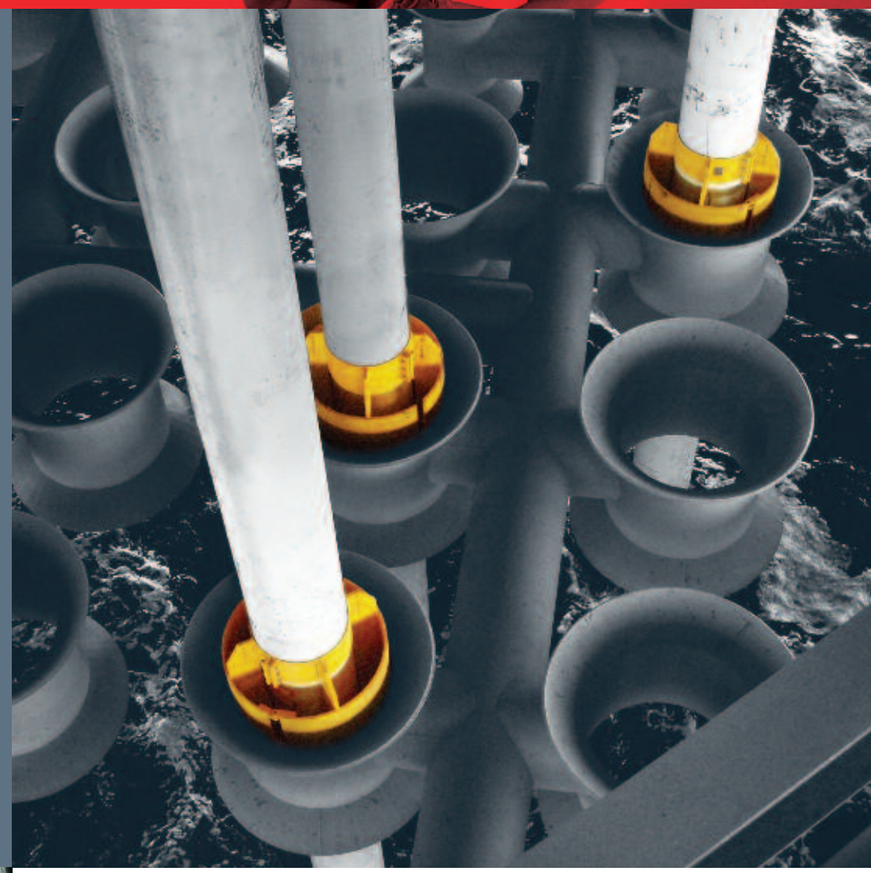
Internal centralizers are commonly designed suitable for radial loads between 5-10 tonnes. They can also be designed for low lateral loads (10 tonnes) and high lateral loads (20 tonnes plus).

The annulus medium is considered when specifying the fasteners and coating to be used for the design.

BESPOKE CENTRALIZERS

BESPOKE CENTRALIZERS

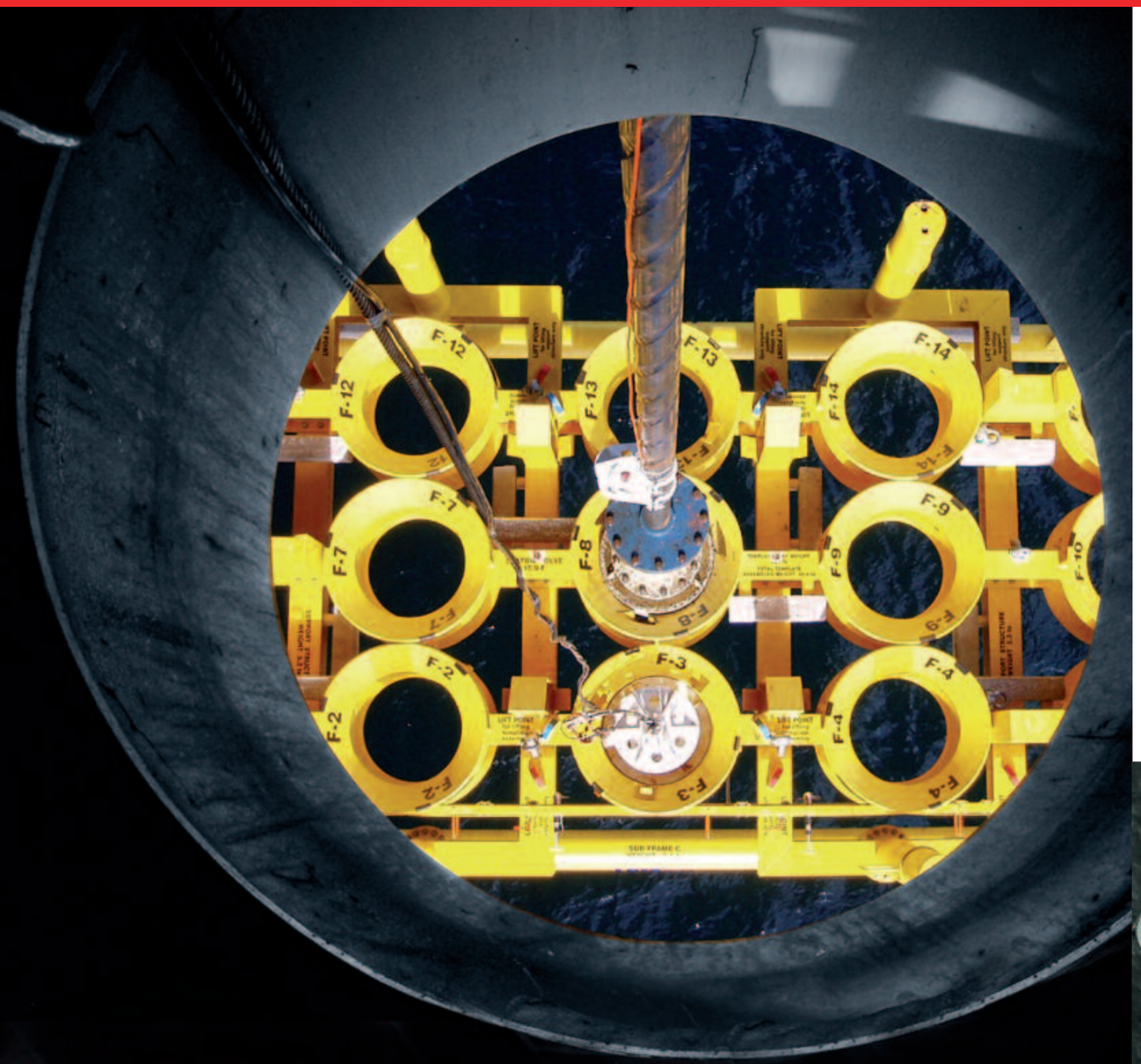
When you have a non-standard application or operating challenge, Claxton's proven experience in structural engineering can help.



LEARN MORE

Claxton's track record in bespoke engineering to solve specific operating challenges extends to centralizers, where we've delivered special designs to cope with large amounts of vertical movement and innovative coatings to reduce conductor wear. Learn more about these capabilities in our case studies starting on page 22.

DRILLING TEMPLATES



Claxton has an enviable track record in providing both standard and non-standard templates. Our templates have provided accurate well placement for pre-drilled developments in numerous foundation soil, well-slot and installation configurations.

Templates are bespoke structures, designed to add value to the drilling operation. Claxton is able to bring significant experience to these designs through our in-house design and R&D departments.

Every Claxton template is designed for robust, safe and efficient installation, which can be either from a rig or pre-installed from a suitable vessel ahead of the rig's arrival.

How a Claxton template can help make your project happen:

- Class-leading experience in design and installation – we're confident that we're among the most experienced template suppliers in the world
- Preparation of detailed and optimised rig-specific installation procedures and equipment lists to minimise rig time required
- Huge design library allows for rapid modification to suit your project requirements – reducing design costs and lead time
- Proprietary – and field proven – installation tooling.

Claxton template configurations:

• Bottom Founded

For standard applications with a relatively flat seabed and an inclination that does not exceed project tolerances – and where soil properties can support the required loading.

• Conductor Supported

For applications where a conductor is in situ. Primarily where the seabed requires that the template be supported.

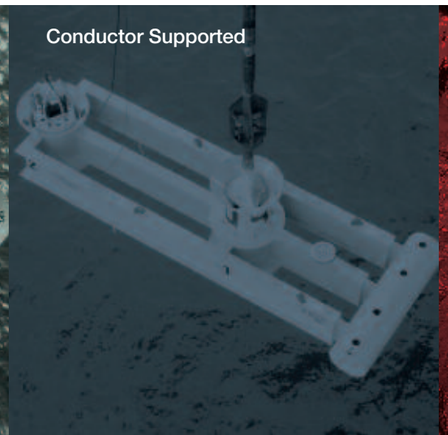
• Conductor Installed

The template is run with the conductor. The benefit being that installation work is primarily surface based – this configuration is useful for applications where an ROV is not available.

LEARN MORE

Claxton drilling templates have laid the foundation for 55 pre-drilled projects all around the globe – including the giant Tombua Landana development. Learn more on page 26.


Bottom Founded


Conductor Supported


Conductor Installed

PROTECTIVE STRUCTURES

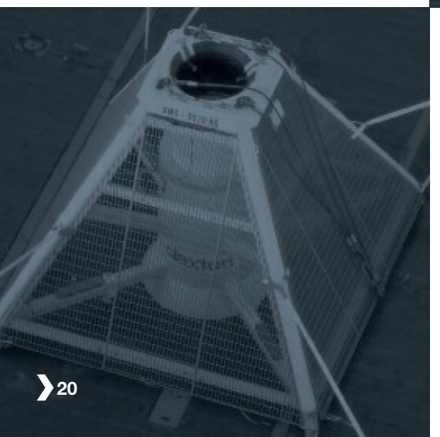
Claxton supplies protective structures to protect subsea assets such as wellheads, xmas trees and manifolds from harsh environments and maritime activity.

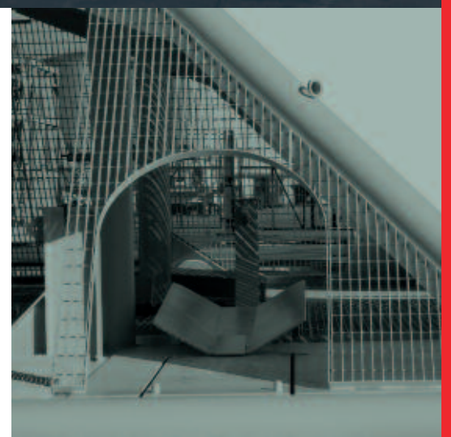
Our structures are designed to NORSOK standard U-001/ISO 13628-1 (or your required standard) and can be remotely installed.

Claxton designs and builds subsea structures for installation from either drilling rigs or back of boat. We can assist with and seek verification from the local authorities and/or fishing/trawling experts with experience in the particular area concerned.

Claxton's snag free structures protect against dropped objects, marine environment damage, are fully 'overtrawlable' and are designed to carry all applicable loads that may affect the structure and piping systems during all phases of its life.

We bring the benefits of our worldwide experience in subsea operations to provide a full service from concept to installation, backed up with a suite of field-proven running tools, installation procedures and industry-leading camera systems to verify successful installation.





CASE STUDIES

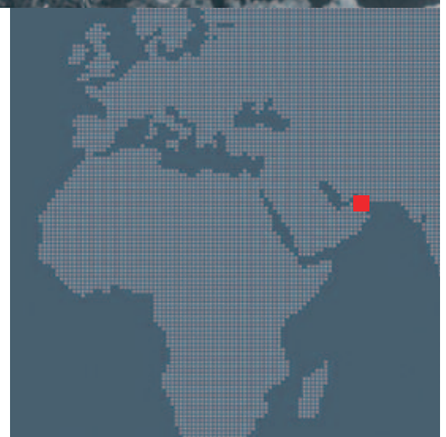
Claxton's promise is that we'll make your project happen – find out how we apply this focus to our clients' structures in the following articles.

CASE STUDY: CENTRALIZERS

CONDUCTOR CENTRALIZER INSTALLATION DURING DRILLING

One of the centralizers during installation on the conductor.

West Bukha field, Oman.



In the oil and gas industry, drilling programmes are often subject to change at very short notice. This, coupled with a determination to make the most effective use of rig time, can present challenges to both field operators and their service companies. Claxton recently devised an innovative solution to the issue of drilling-schedule changes that helped a client to keep its programme on track without compromising the preferred well design.

Retrofitting at West Bukha field, Oman

DNO International ASA was drilling offshore Oman when a short-notice change in the drilling programme brought forward the start of work on the West Bukha 4 well. The design for this well called for the installation of four centralizers on the conductor to provide structural integrity, but only two were available at the time of drilling. The schedule change meant there was no time to order the necessary additional platform centralizers from Claxton before drilling began.

DNO could have opted not to install the additional centralizers, but this was undesirable owing to the fatigue damage that can result from the movement of the conductor and the damage to the platform guides that the conductor repeatedly hitting them could cause.

Nick Dale, Claxton's business development manager, Far East (formerly general manager, Claxton Dubai), explains, "Usually, we expect to install the platform centralizers at the same time as the conductor system, but, in this case we were unable to install a full set, so we had to find an alternative solution.

We suggested retrofitting the additional centralizers during drilling, as this would enable the rig to move onto the well and start operations while we designed and fabricated the items in parallel."

Analysis of the well by Claxton's Acteon sister company 2H Offshore had shown that the conductor would require these additional centralizers: one located approximately 10m subsea and the other in the splash zone.

Dale says, "When faced with this kind of problem, some operators develop their own in-house solutions. Unfortunately, these may be simplistic or poorly engineered, and can often corrode or fail quickly and thus eventually require removal and replacement. DNO decided to use our retrofit solution because it would deliver a well-engineered design that could be installed off the critical path to save both offshore rig time and costly replacement in the longer term."

A comprehensive solution

Claxton in Dubai provided a complete packaged solution, including platform and rig surveys; design, analysis and fabrication of subsea and surface retrofit centralizers; and a full installation package. Claxton also engaged and managed the activities of third-party abseiling and diving teams to assist with installation.

Mid-way through the drilling programme, during drilling of the long 13.⅜". casing section, there was sufficient space on the rig to enable Claxton to mobilise the installation team, abseilers and divers, and complete the subsea installation of the centralizer with no adverse effect on drilling operations.

Subsea centralizer installation

Gordon Hunter, drilling manager, DNO said, "Claxton provided a seamless service in terms of engineering, planning and final installation of the retrofit centralizers. During an intense period for well operations, the Claxton team went about their business in a safe and professional manner to install well-engineered centralizers right first time."

The system that Claxton supplied was a 31" conductor × 40" conductor guide, retrofit, hinged centralizer complete with polyurethane buffers, quick-release collapsible hinges and profiled fins to enable the centralizer to interface with the platform guide funnels. The centralizer had a corrosion-resistant, thermally sprayed aluminium coating.

The time to completion, discounting offshore delays, was approximately six months. This included the three months from initial discussions to contract award, one and a half months of fabrication work, one and a half months of planning, surveying and writing procedures, and finally one week offshore to complete the installation process.

Dale said, "We strongly recommend that clients should consider centralization at an early stage when planning new wells, but retrofit solutions like this one give the added flexibility to enable them to address fatigue concerns on existing wells before damage occurs and so minimise the risk of expensive repair work. A retrofit solution was perfect for the project at West Bukha 4 where there was insufficient time to fabricate the centralizers and run them with the conductors."

Claxton has extensive experience of modifying and retrofitting centralizers, and carries a broad range of proven designs. This experience made it possible to take the installation work off the critical path of the DNO project, as Dale explains, "We have provided several styles of retrofit centralizer to clients worldwide. Centralization is an area that may be neglected during the planning process for new wells, and ever-changing drilling schedules may mean that we have to react quickly to satisfy clients' priorities."

Retrofitting has proved its value in other fields and many different situations, as Dale points out, "We have provided retrofit solutions for old wells that were installed without centralization and where the conductor and guides were showing signs of fatigue through the unrestricted movement of the conductor within the guide. We have also provided retrofit solutions for wells where the space-out prepared during drilling was incorrect and the centralizers were pre-installed in the conductor and not in the guide."

The retrofit approach also provides a valuable solution in cases where components have reached the end of their design life. Dale concludes, "The ability to devise and deliver solutions that meet customers' needs at all stages of a field's life cycle is a key part of what we do. This is a particularly important consideration when the industry is seeking to extend the life expectancy of infrastructure and assets."

CASE STUDY: PROTECTIVE STRUCTURES

VALUABLE PROTECTION

The subsea protective structure being prepared and installed.

You would be forgiven for thinking that there's not much to get excited about when it comes to protective structures – they are, essentially, a cage placed on the seabed to prevent damage to equipment from fishing activity or dropped debris. However, as Claxton has recently proved on a project for Senergy, with the right mix of experience and equipment it's possible to add real value to both the structure and the installation process.

Claxton was contracted by Senergy to utilize a structure which had been designed and fabricated for a previous project. Claxton was able to rapidly modify the structure for Senergy – and provide all the appropriate running tools which enabled a smooth installation.

The structure, weighing some 5,570kg with a footprint of 3.8 square meters and standing 3.1 meters tall, was originally built to protect a Vetco SG1 wellhead on the Dana Scolty field. After modification, the structure would again be used for Dana, but this time on a Dril-Quip SCS wellhead – on Platypus well 48/1a-5, in some 142ft of water.

To accommodate the new wellhead, Claxton fully refurbished the structure and lowered the landing ring. The spec also called for chemical inhibitor sticks to be fitted inside the structure – these sit just inside the wellhead profile and release chemicals which create a protective environment inside the wellhead, reducing corrosion.

Additionally Claxton fitted an array of our proprietary cameras to the structure – MULTICAM was specifically designed to monitor installation processes and MULTICAM units were mounted to observe the wellhead guide-cone at the base of the structure. An additional camera was mounted to provide a view of the engagement and disengagement of the J-Slot running tool.

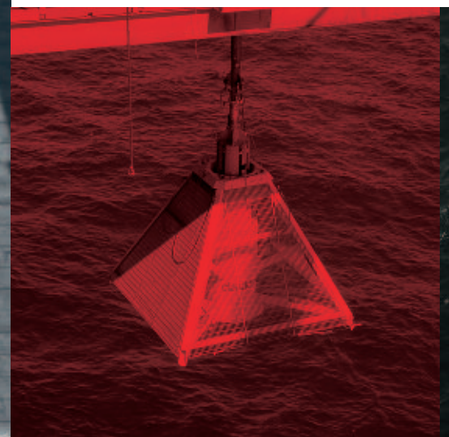
The structure was fitted with extension legs which would be activated by a 'sling sub' arrangement. The sling sub would be operated when the structure's running tool was disengaged – allowing the extension legs to drop onto the seabed and remove the potential for fishing nets to be caught on the corners of the structure.

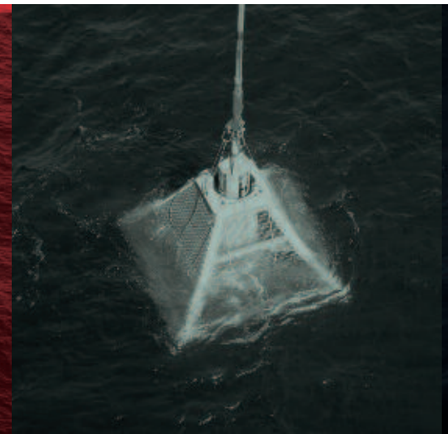
The protective structure was installed from the Transocean Labrador. The total operation from rig-up to the installing of the structure and rigging down was completed in just seven hours. It was here too that a Claxton tool was able to add significantly to the procedure. Claxton's jet sub was installed on the running equipment which allowed for adjustments to be made during installation using a high pressure water jet to either offset currents or guide structures into position.

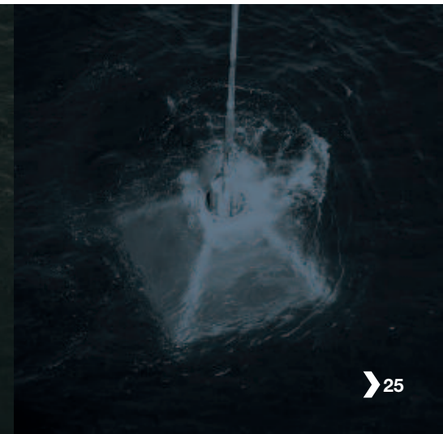
Neil Youngs, project engineer for Claxton, felt the jet sub was instrumental to the smooth installation of the structure:

"We used the jet sub to guide the structure between 1.5 and 2 meters. We were working during a strong spring tide and without the jet sub we would have taken considerably longer to engage the structure over the wellhead."

Neil continues, "We've worked with both Senergy and Dana on previous projects – they've been great partners to work with. So we were especially pleased to have worked with them again on this operation and to deliver the structure, modifications and installation in such a timely manner".







CASE STUDY: DRILLING TEMPLATES

CLAXTON TEMPLATE INSTRUMENTAL TO TOMBUA-LANDANA

The first of two Claxton contributions to the giant Tombua-Landana project is not that easy to spot, even though it is literally fundamental to this world-class project.

Production facilities weighing 36,500 tonnes are supported on a compliant tower weighing 56,400 tonnes. This stands on a tower-base template of 3,000 tonnes, which in turn rests on a levelling-pile template – under which, right on the seabed, there is a 12 slot pre-drilled template providing 9 well slots and 3 docking slots, designed, supplied and installed by Claxton.

Weighing just 30 tonnes, the small but perfectly-formed template provides the pattern for the first wells drilled before the giant platform was installed. Indeed, it also determines the location of the platform and all 38 wells that will be needed to complete the development in the years to come.

Claxton won the job of providing the template for CABGOC on the back of lessons learned during the installation of a similar template for the Benguela-Belize platform. On that occasion the company was called in late in the day to help install the template, which had been provided by another supplier. “We got the chance to demonstrate our expertise in this area on Benguela-Belize and, as a consequence, were awarded the contract both to supply and install the pre-drilling template on this project,” explains Rowan Patterson, Claxton’s business development director.

The template was installed in two stages. It was initially lowered onto the seabed from an anchor-handling vessel. The Pride Venezuela semisubmersible drilling rig then picked up the template on drillpipe fitted with a Claxton-supplied overshot double-J running tool and carefully located it over a single well already drilled in the seabed. It was then correctly oriented, landed and locked onto the well’s 30" wellhead housing.

A further slot was then drilled through the template and a second 30" conductor installed, at which point the orientation of the template was effectively fixed.

In all, four wells were pre-drilled through the Claxton template (of nine possible), each furnished with a 30" low-pressure subsea wellhead and an 18.¾" high-pressure wellhead on 20" casing. A docking pile was also installed through an outer, purpose-designed slot on the template before drilling was suspended and the rig moved away.

This also marked a pause in Claxton’s involvement, during which some serious construction work was undertaken. First, a levelling-pile template was fitted over the well template, followed by four levelling piles, their correct alignment being assured using two guide pin slots in the Claxton template. The main tower-base template was then added and 12 foundation piles installed; thereafter there was just the small issue of adding the tower itself and then the topsides.

At this point Claxton returned to carry out another pivotal task in the development: the tying back to the platform of two of the first four wells. (CABGOC took the decision to delay tying back the other two wells in favour of drilling further platform wells.) Claxton prepared all the procedures for a process that began with the removal of corrosion caps from the 18.¾" high-pressure wellheads and the landing of 26" conductors on both wells to provide conduits back to the platform’s well deck. “The challenge here was to ensure the correct space-out of the 14 conductor centralizers spread along the nearly 40 conductor pipe joints,” says Patterson. “Accurate measurement and careful calculations ensured that with the conductors locked onto their subsea wellheads all the centralizers engaged perfectly within the guides situated between the bottom of the tower and the platform.”

For each of the wells, following the installation of the conductor, 13.⅜" and 10.¾" casings were landed and locked into the subsea wellhead and a high-pressure wellhead fitted to the former at the platform welldeck ready to accommodate the production tree.

“There is great satisfaction from being involved in complex projects like this one,” says Patterson, “when everyone is required to play their part to the very best of their ability to ensure the overall success of the venture.” In this case, Claxton’s contributions were both essential to the timely completion of the project, both firmly on the critical path to first oil from Tombua-Landana.

The Tombua-Landana project, Angola, West Africa.

CASE STUDY: DRILLING TEMPLATES

TEMPLATE FOR SUCCESS

The Volve template being installed.

The Statoil Volve field lies in the Norwegian sector of the North Sea and is, unusually, producing oil via a modified jackup rig, the Maersk Inspirer. The choice of the jackup for the drilling and then the subsequent production presented some interesting challenges, not least in relation to the drilling template, a vital component at the outset of field development.

Ann Vicens, project engineer, was intimately involved throughout the project to design, fabricate and install the Volve template. She explains some of the issues that she and her team had to deal with:

"The decision to produce the field via a modified jackup rig had serious implications for the way the wells were spaced out on the seabed. For practical reasons, the jackup had to be fixed in place before the template. This meant we were then forced to locate the template – crucially, without the help of any physical guides – very accurately on the seabed to ensure that the slots precisely reflected the layout of the well bay. Failure to achieve this would have created serious difficulties when tying back the individual wells and would also have a serious impact on the fatigue life of the risers."

In fact, it was determined that the template had to be installed such that the centres of the outermost slots were within 200mm of a reference point provided by the location of the corresponding well centres on the rig. Obviously, the template also had to have the same heading as the well bay; it was calculated that a 1° error would reduce the tolerance for the template's position from 200 to 120mm.

The installation solution that Claxton proposed involved slinging the template beneath the jackup well bay for its journey out to the field, which meant the template would be submerged and subject to considerable drag. To overcome this loading, a robust seafastening arrangement was devised whereby upstanding beams on the template were bolted to the underside of the well bay. Once at the required field location and after the jackup was raised, the template was run to the seabed on a drillstring secured within the central slot. Two optical gyros, rather than the usual one, were used to monitor the template as it was lowered to the seabed; one was mounted on the drillstring and the other on the template itself. By comparing the data from the two gyros, it was possible to detect any bend in the drillstring and so obtain an accurate indication of the template's heading, pitch and roll, and also any displacement relative to the well bay throughout the installation process. Calm weather and a slack tide during the installation combined with a remotely operated vehicle (ROV) that was big enough to be able to nudge the structure into place – as well as a good deal of patience – helped to ensure that the template was ultimately set down in exactly the required position and orientation.

"We take great pride in our role in this challenging project," says Vicens. "This was one of the biggest templates that UWG, now part of Claxton, had designed, and we supplied it on time and within budget. We also developed the installation procedures, and had two of our engineers on the rig to oversee what turned out to be a highly successful offshore operation. I think the greatest benefit to the client, however, was the ability to tie back the Volve wells to the production jackup without any undue difficulties."

The Volve template has enabled Maersk to employ the Inspirer jackup in a role for which it was not originally designed. It has also defined a new option for field developers; Claxton has received expressions of interest in the technology from at least one other operator. In conclusion, it could be said that Volve has itself provided a valuable template for further applications of this nature.

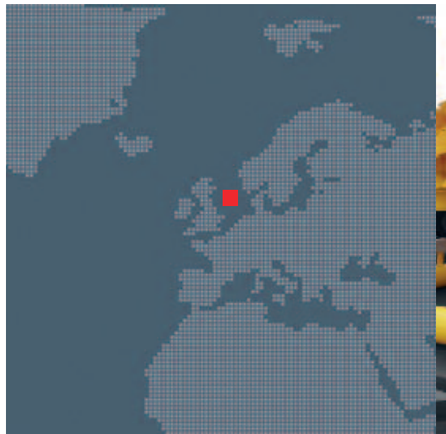
Central to the development

The Volve template was designed and built by Acteon company UWG, which is now incorporated into Claxton. It has 15 slots in three banks of five; the central slot was used to run the template as well as for drilling. The template was approved by DNV, whose representatives witnessed all the pre-delivery tests. Weighing in at 50 tonnes, the structure was built in five parts in Great Yarmouth, UK. It was then transported to Haugesund in Norway for assembly before being sea-fastened to the Maersk Inspirer for the journey to the field.

A key feature of the template is the mechanism used to centralize the conductors within the slots during the primary cementing operations. It was a condition of the design that point loading on the production risers through the template during well construction and throughout the life of the field should be eliminated. There was to be no contact between the conductors and the template after the conductors had been cemented in place. This meant having centralizers that could be withdrawn from the slots once they had performed their important role.

Claxton's solution to this problem was to build three retractable hydraulic cylinders into each slot. Activated by the ROV, these were extended to hold the 30" conductors in place during cementing, and were later retracted. The cylinders, each rated at 2100 psi, were grouped in five banks of nine and were powered from the ROV using the same environmentally acceptable hydraulic fluid used to control the ROV's other mechanical functions. It is believed that this is the first time such a conductor centralizing system has been used.

The Statoil Volve field, North Sea.



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