

Oceaneering Uses Subsea Acoustics to Position Wells

Survey and ROV teams accurately position seven wells offshore Guyana

Project Overview

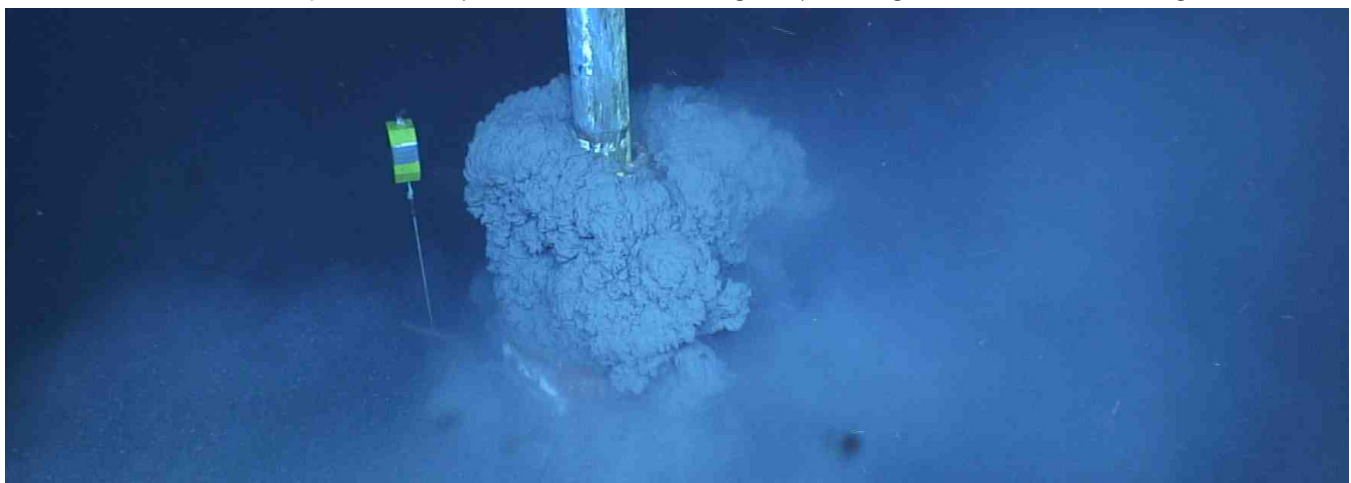
In early 2018, a major operator started the top-hole drilling of seven wells offshore Guyana. Accurately drilling the wells required that they be positioned horizontally and vertically to within inches of predetermined values. Oceaneering provided engineering, project management, and offshore operations using subsea acoustics to meet this requirement.

Issues

Failing to accurately position a well can force the re-engineering or adjustment of field design, thus increasing project time and cost. The client discovered this fact early on after a previous

exploration well ended up positioned 56 ft (17m) away from its originally proposed site. As a result, the client had to adjust the field's proposed location, including structures and pipelines. This required an additional round of engineering to confirm if the move was possible.

Ensuring that a field's layout is closer to actual design not only affects schedule and expenditure, but can also extend the asset's lifespan, while ensuring other phases of the project progress smoothly. For example, if a casing is not vertical, its integrity could be compromised as it is no longer operating in a state it was designed for.



Elevation, or stick-up height, poses another challenge for rig positioning. The low-pressure wellhead housing (LPWH) is designed to work at a specific height. If it protrudes too high from the seabed, the integrity of the housing can be affected. During its operational lifespan, the conductor will have a subsea tree installed; at times, it will have a large BOP attached to it. Forces from these structures, along with others, could have negative effects if the casing is not installed properly.

If the conductor stick-up height is too low, the vent tubes—used when setting casing to enable seabed excavation—could be buried and become unusable. The subsea tree may not have room to attach and may need to be dredged out of the mud. All of these issues can cause operational setbacks in terms of rig schedule and cost.

The conductor is the foundation of the actual well. Since everything else is built off of that, it is critical that installation is executed without error.



The Oceaneering Solution

Oceaneering's project management team determined that the existing Sonardyne Lodestar GyroCompatt (LGC) should be deployed to accurately position and orientate the wells. The LGC combines the use of a subsea computing and telemetering transponder (Compatt), gyro compass, an inclinometer (pitch and roll sensor), a sound velocity sensor, and a depth sensor (diquartz) to gather data on seawater pressure.

The LGC gathers information on position, depth, heading, pitch, roll, and speed of sound through water. This information can be used simultaneously or independently to position the unit horizontally or vertically. It also can measure inclination and heading, simultaneously or independently. All information can be transmitted acoustically through the water.

Before the existence of the LGC, sensors had to be interfaced and used independently. The LGC solves this challenge by combining these sensors into a single unit, simplifying the process.

Once Oceaneering identified a solution, the team procured the necessary surface and subsea positioning equipment, created and approved operational task procedures, assembled the crew, mobilized the drillship and support vessel, and executed safety tasks, including survey mobilization, antenna installation, COMPATT preparation, and ROV interfacing.

Execution Plan

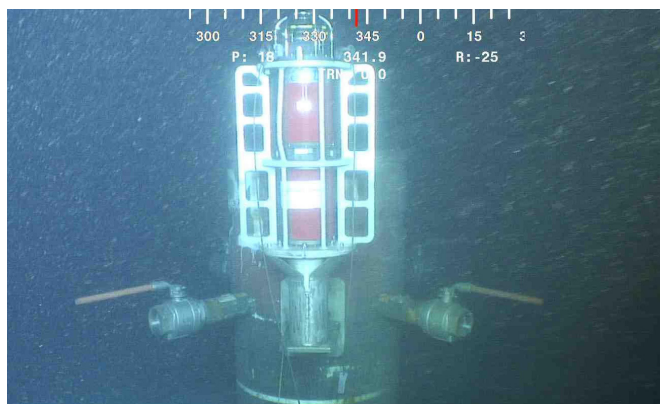
The request for quote was made in late 2017 and included accurately positioning, elevating, and inclining casings and low pressure wellhead housings in 6,562 ft (2000m) of water; the formal award was made in late February 2018.

The project spread—which included a surface positioning spread and a subsea positioning spread—was mobilized in Fourchon, Louisiana, in mid-March 2018. The *C-Installer* sailed to Guyana and arrived in mid-April, where the initial project operation of setting the permanent long

baseline (LBL) acoustics arrays took place. This process involved installation of the seabed frames from the vessel with a crane. The Compatt units were deployed by the ROV. The array was then calibrated by measuring the baselines and depths, and performing the network adjustment. Finally, the position was confirmed in the array. The same process was used for all wells.

The *Noble Bob Douglas* was mobilized in early May 2018 and the drilling campaign commenced and was completed in July 2018. A second phase of drilling is planned for late 2019.

Challenges



For this project to be successful, Oceaneering's survey group needed to design, fabricate, and procure specific tooling, primarily the assembly that holds the LGC during subsea use, and the interface stabs that help the LGC and assembly connect to the well conductor. Given the time constraints for the project, the group was able to expedite the design and fabrication process to get the tooling delivered on time.

Oceaneering also needed to transport equipment to Guyana, a new location of operations for the company and where we did not have well-established logistics channels. The time span between the contract award and the vessel sailing from the U.S. to Guyana was short due to the timing of the award. Typically, Oceaneering has 30 to 90 days between a contract award being made and a vessel sailing for work. In this case, Oceaneering had fewer than 30 days.

Furthermore, the client had tooling from another source, which added additional challenges for Oceaneering. The team found that the fit and dimensions of the tooling differed from those on the initial drawings sent to Oceaneering. This caused some fitment and offset issues that Oceaneering had to resolve. For example, Oceaneering's LGC tool fit in the bucket provided by another company, but it fit loosely. The project management team had to find a way to secure it snugly to ensure consistent readings. Oceaneering also identified inconsistency in the tooling, so the team had to measure each piece and log the measurements to ensure that no offset errors affected operations.

Equipment Highlights

The subsea ultra-short baseline and LBL subsea equipment and software accurately positioned the wells with few issues.

Most of the LBL work, including array sets and marker buoy installations, were performed by Oceaneering's survey group on the multi service vessel which was equipped with an ROV. Oceaneering interfaced a full LBL-capable kit on the ROV placed on board the drillship to perform the positioning work. The installation of the well conductors was performed by the drillship and the Oceaneering ROV.

Results

All wells were positioned and installed as per design with +/- 1-ft (.3 m) tolerances for height and position and +/- 0.5 degrees for inclination.

Project Highlights

The project marked Oceaneering's first use of the LGC for well stick-up height and inclination. Oceaneering also was able to deliver quality project management, logistics, tooling and accurate positioning work within a short time window and without major delays and cost of poor quality incidents, keeping operational and safety risks at near zero.



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