



Case Study : Offshore pile driving monitoring

G-Octopus carry out PDM services during a wellhead platform installation off the Argentinian coast



The project

G-Octopus were engaged by an oil and gas developer, to provide Pile Driving Monitoring (PDM) services during the installation of the piles of a wellhead platform in a gas field off the coast of Argentina.

Our challenge

The location of this platform poses several installation challenges, including raging seas, extremely high winds and strong currents, not to mention a water depth of over 52m. The G-Octopus team were appointed to carry out Pile Driving Monitoring (PDM) during the installation of driven pile sections of a four-legged jacket for the wellhead platform.

The initial driven pile section was needed to act as casing to reach the top of the competent soil/rock at depth and allow subsequent drilling in a protected way (no drill mud losses). The goal of the piling was to guarantee the integrity of the pile tip, to allow for subsequent drilling inside and allow for the piles to be completed with the drilled insert pile, which is then grouted to the drilled rock.

Our client also requested that we install instrumentation over the drilled part of the pile, to determine the available axial capacity of the pile at end-of-drive.

The solution

In preparation for driving, the G-Octopus team were able to readily and confidently reference information on the pile behaviour as this was performed by our sister company, Cathie, with driveability analyses. The geotechnical investigation identified rock layers and hard driving conditions so G-Octopus assessed and implemented their unique SafeTip procedure ahead of the jacket installation in order to reduce the risk of local pile tip buckling and pile toe damage while driving through the hard layers.

Due to the location of the site, the team carried out the instrumentation and marking of all four piles as well as the add-on sections of each of the four foundation piles onshore and were on hand during and after transit to check prior to driving.

Once on location, the team carried out PDM on the driven pile. It had already been identified that there was a risk of ovalisation of the pile base so strict and precise control over the maximum stresses induced by hammer driving was required. The team achieved this using their SafeTip method, to control the stress at the pile tip in order to limit, as far as possible, the risk of pile tip buckling.

The team then carried out back-analysis of the driving data as well as analysis of the pile axial capacity in compression at end-of-drive using the signal matching method on selected blows with CAPWAP software.





The impact

As the driven pile sections needed to support a drilling rig, it was vital the operations were carried out smoothly and safely as planned and the instrumented casing piles were driven down to their target penetration. Thanks to the SafeTip procedure, no difficulties were encountered during driving, even though the hard layer, which meant the piles could be drilled inside for extension as the tip was still intact.

The team were able to evaluate the piles capacity at the end of the drive thanks to the high quality data generated through PDM, and providing the expected axial capacity once the soil plug was cleaned inside the pile.

Services included:

- SafeTip
- Pile Driving Monitoring
- Back-analysis
- Analysis of the pile axial capacity

Pile information:

- Diameter: 1422.4 mm
- Thickness: 45 mm
- Length below seabed: about 15m

Equipment used:

- Pile Driving Analyser
- Strain gauges
- Piezo-Resistive (PR) accelerometers
- Cables





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