Contract: Benguela Belize Project

Client: Heerema

Location: Offshore Angola

Challenge

Benguela Belize was built as a Compliant Tower in Block 14 offshore Angola in 390m of water 45 miles offshore. Installation was carried out by Heerema using the "Thialf" – the first time that a 10,000t lift had been carried out between April and May in Angola.

The Compliant Tower consisted of the base construction; levelling piles template (400t), levelling piles (310t each), tower base plate (3,100t) and the foundation piles (1,000t each).

The second phase consisted of the tower base section (24,700t), tower top section (8,000t), manifold support frame and other small lifts (4,200t) and large module lifts amounting to 35,000t including the manifold support frame. These modules included the North Module (10,700t), South Module (9,100t), North and South Hubs, drilling modules, living quarters and flareboom.

About 80% of the fatigue life was expected to be used during installation – and this was a major challenge. In order to ensure that the allowable fatigue life was not exceeded, the tower top section, manifold support frame and some of the topsides had to be installed within a certain number of cycles. Due to delays, resulting in the increased potential for fatigue damage, temporary water tanks were placed on the manifold support frame. This was done in order to change the natural period of the Compliant Tower until the remaining topsides could be installed.

Expertise provided

Noble Denton was appointed marine warranty surveyors for the project reporting to Heerema who was the main installation contractor.

Project management included:

- Fatigue analysis in the approval process, which is normally only considered in post installation analyses
- The Team considered several discrete marine operations together, rather than just one at the time, before approving the operation
- Attendance in South Korea and Corpus Christi, USA, for the loadout and sailaway of the compliant tower, manifold support frame and topsides structures
- Attendance for the pipeline transportation
- Attendance offshore for the launch and installation of the compliant towers, the installation of the manifold support frame and topsides, and the installation and tie-in of the pipelines

Outcome and benefits

- The value and importance of considering fatigue as part of the marine warranty approval was uniquely demonstrated by Noble Denton
- The consequences of being unable to install 4 components within a short time were substantial. Noble Denton's unique solution of providing water tanks, to change the natural period, was used as an alternative solution
- Compliant Towers are uncommon and the method in which the components were constructed was exclusive to the Project
- It is unusual to launch such large structures nowadays and Noble Denton's successful installation proves that the expertise is still applicable for these operations
- The use of a manifold support frame, rather than having an integrated deck, was also notable with respect to the construction

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