



OTC 20237

Developments in Deepwater Spar Installation

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This paper was prepared for presentation at the 2009 Offshore Technology Conference held in Houston, Texas, USA, 4–7 May 2009.

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Abstract

During the last seven years Heerema Marine Contractors (HMC) has installed more than half of all Spars in the deep waters of the Gulf of Mexico. The dual crane deepwater construction vessels have proven repeatedly that a complete Spar installation, from piles to hull, topsides and SCR (Steel Catenary Riser), can be performed very efficiently with a single vessel.

Since the first Spar was installed, significant challenges have been overcome throughout every phase of the Spar installation. Spar anchor piles for example have included installation of both driven piles in water depths of up to 4,900 ft, and of suction piles in 8,600 ft of water. Another good example is a recent industry first, where the VIV strakes on the belly side of a Spar were installed offshore. This offshore installation eliminates the need to compromise in the design of these VIV strakes, which will be beneficial for the Spar during the rest of its operational life.

The advantages of using installation vessels with large deck space and with dual cranes with a high lifting capacity, is demonstrated in almost all phases of the Spar installation. A large deck area with dual cranes allows for easy handling and unloading of items such as piles and Aircans. At the same time it is also possible to store several mooring lines on the deck at once, allowing for flexibility in the order in which these lines are installed. An additional advantage of the Deepwater Construction Vessel (DCV) Balder is that it has installed both Spiral Strand Wire and Polyester mooring lines with the 10.6 m diameter Mooring Line Deployment (MLD) winch. The Semi Submersible Crane Vessel (SSCV) Thialf has recently been outfitted with a similar capability.

HMC is best known for its heavy lifting capacity, which is reflected by the installation of Spar topsides with modules of up to 8,695 st. The large weight allows significant savings in cost by outfitting most topsides components onshore at a yard.

A specific example of tools used in order to obtain flexibility is given by means of the in-house developed Mooring Line Hook-up software. This software allows greater insight in the various forces acting on the Spar and the installation vessel. Software such as this allows making offshore decisions for the best route forward during the installation of mooring lines, while reducing overall risks and downtime. It is shown that especially during the installation of polyester mooring lines, where the forces are less well known in advance due to fabrication tolerances, an adjustable procedure has its advantages.

In 2008 HMC introduced the Incident and Injury Free (IIF) program. This program aims to change the mindset from one of "accidents happen" to one where working incident and injury free all the time is achievable for everybody.

In conclusion this paper shows that all three of HMC's installation vessels have proven that they are capable of deepwater Spar installation. HMC has the advantage of having two vessels with similar deepwater capability, providing considerable savings on mobilization, mode change and weather downtime and allowing greater schedule flexibility.

Introduction

One may question the necessity of using a large heavy lift vessel for the installation of deep water floating structures in the Gulf of Mexico. At face value, most installation work for Spars can in principle be carried out with the "smaller" assets, which have been introduced by many contractors operating in the deep waters of the Gulf.

In reality however, there are many factors which have made the deep water Operators decide that for the installation of a deep water Spar, for example, the unique equipment offered by a contractor like Heerema Marine Contractors definitely adds value to their developments. As a result of this, Heerema Marine Contractors, (HMC) has been involved in the installation of more than half of all deep water Spars in the Gulf of Mexico. Although some of these were partial installations, where HMC offered an urgently needed helping hand, in most cases it involved an integrated transport and installation service.

HMC's track record includes the deepest development to date; the Shell-operated Perdido Spar in 7,817 ft water depth in the Alaminos Canyon area, but also includes the successful installation of a number of Spars in the infamous loop currents and eddies of areas like Green Canyon and Atwater Valley.