



OTC 18005

Set-up Characteristics of Suction Anchors for Soft Gulf of Mexico Clays: Experience From Field Installation and Retrieval

P. Jeanjean, BP America Inc.

Copyright 2006, Offshore Technology Conference

This paper was prepared for presentation at the 2006 Offshore Technology Conference held in Houston, Texas, U.S.A., 1-4 May 2006.

This paper was selected for presentation by an OTC Program Committee following review of information contained in an abstract submitted by the author(s). Contents of the paper, as presented, have not been reviewed by the Offshore Technology Conference and are subject to correction by the author(s). The material, as presented, does not necessarily reflect any position of the Offshore Technology Conference, its officers, or members. Papers presented at OTC are subject to publication review by Sponsor Society Committees of the Offshore Technology Conference. Electronic reproduction, distribution, or storage of any part of this paper for commercial purposes without the written consent of the Offshore Technology Conference is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of where and by whom the paper was presented. Write Librarian, OTC, P.O. Box 833836, Richardson, TX 75083-3836, U.S.A., fax 01-972-952-9435.

Abstract

This paper presents results from installation and retrieval of suction anchors in the Gulf of Mexico. The increase in capacity due to set-up is discussed. The two components of set-up, pore pressure dissipation and thixotropy are evaluated and their role in overall gain in friction with time is presented.

The field data suggests that suction anchors will develop their ultimate friction capacity quickly. No gain in friction has been observed for set-up times between 80 days and 1300 days. The data suggests that a typical friction factor alpha at 90% consolidation for Gulf of Mexico clays is between 0.7 and 0.75 for the average of the outside and inside friction.

Introduction

Suction anchors have been used extensively in the Gulf of Mexico over the last decade (Andersen et al, 2003). They have been used both for permanent applications such as manifold foundation or mooring of floating production systems but also for temporary mooring of drilling units.

During the installation of suction anchors for permanent applications, the penetration of the anchor is sometimes interrupted because of pump malfunctions, ROV malfunctions, or other mechanical issues. For temporary mooring applications, the anchors are typically retrieved once the well is finished drilling, although some anchors may be left in place in anticipation of future additional drilling activities at the same location.

The data presented in this paper was not acquired for the purpose of studying the set-up of suction anchors. Rather the author extracted the information presented herein from readily available data. The data set is therefore incomplete. For site where suction anchors were used for the temporary mooring of

drilling rigs, there is sometime no information on site specific shear strength because the well is drilled in the early stages of the project, before a geotechnical site investigation is performed, or the project never materializes. For sites where shear strength information is available, the borings or cores may not be in close proximity to the rig mooring pattern, particularly if the development involves subsea wells being tied back to a center platform. This experience nevertheless provides valuable information. Because of the typical minimum duration to drill a well, the set-up time for between installation and retrieval is usually of 70 days or more.

The Database

The database presented herein includes two main suction anchor applications: permanent and temporary mooring or foundation applications.

None of the anchors presented in this paper included circular "ring" stiffeners, which have been shown to influence the inside friction both during installation and retrieval (Andersen et al, 2003). All stiffeners and diaphragms present were longitudinal.

Suction Anchors for Temporary Mooring Applications.

Recorded data

In this paper, the suction anchors used for the temporary mooring of drilling vessels were installed with anchor handling vessels. The available data included:

Anchor geometry:

1. Diameter and wall thickness of anchor
2. schematics of structural design (including internal stiffeners and overboarding skids). Wall thickness varied between 1.0 and 1.5 inch.
3. weight of the anchor

Installation record:

4. date and time of installation
5. self weight embedment depth
6. embedment pressure vs depth
7. final penetration depth

Retrieval record:

8. Date and time of retrieval
9. Tension load applied to anchor, measured at the winch on the deck of the vessel.