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Simulation of Torpedo Anchors with fins for floating offshore platforms under pull-out forces

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Abstract

According to the increasing exploration projects, derivation and removal of hydrocarbon reservoirs in deep water and the impossibility or difficulty and cost of access to the sea bed, for holding a variety of immovable oil platforms, Offshore and marine structure engineering try to extend to using floating and semi-submersible platforms in deep-water in the world. Due to the deployment of these platforms, it is necessary to connect the anchor to the seabed with mooring line and keep the platforms stable and immovable.Torpedo-shaped anchors, with advantages such as cheap, easy to install, you can re-use and fast installation and do not require special tools to install the agents and contractors further consideration and they are interested in using torpedo anchors for semi-submersible and floating platforms.Few studies of the behavior of torpedo anchor on the sea bed's soil in laboratory and field have been done.

In this research, torpedo anchor under tensile force is modeled under tensile force and it is drawn out from inside of soil. For this purpose, the method was used to determine is the specific torpedo location change in soil. Finite element modeling software is used to show soil and a torpedo-shaped behaviors. And finally capacities that they are obtained by calculating (the forces and capabilities) were compared using API Regulations.The output results can be seen by examining the capacities obtained by modeling finite element software capacity and the calculation formulas are reasonably consistent API Regulations.It is obviously that the obtained capacity from the modeling, finite element computer modeling capacity and the forces calculated from API formula (equations) are reasonably consistent.

Keywords: Torpedo-shaped Anchor, floating platform, numerical modeling, API Regulations

Introduction

In the past, the Drilling platform in deep water (more than 18 meters depth) consisted one or more columns that they were kept the top of the platform.

Those platforms were transferred to the operating area and then were entered the water. The platforms were placed on the sea floor, and drilling operation began. It is found while the platforms are floated, wave's forces cause small or large displacements. Semi-submersible platforms must be connected to the sea floor by anchors to preventing movement against forces. Environmental loads, including loads that they are caused by natural phenomena such as wind, water currents, waves, earthquakes and ice effect to the structure. Environmental loads also are included in changes hydrostatic pressure and buoyancy forces on the platform members by changing water level. And the mooring lines transfer forces to the seabed.

Previous research

Nowadays, using torpedo anchor becomes common, because of low cost, easily installed and easily build and installation. The first offshore structures has always precise foundations of offshore structures have been changed, since 1947.

First off offshore structures were in shallow waters, and it was tried to generate this kind of precise foundations in deep water. Today, larger platform structures are moved into deeper waters.[1] For example, piles used in Cognac platform in water depths of 313 meters with a diameter of 2.15 m and a length of 190 meters, which is approximately 137 m in the soil were penetrated. The torpedo-shaped anchor mooring system was used to fix the moving platforms and floating storage and offloading will be used. Torpedo-shaped anchor is able to withstand the permanent loads. (Medeiros& et, 2006)[2] reported that torpedo shape in RasinCampos, sea Brazilian, Petrobras Co. more than ninety torpedo anchors without fins (finless) with dimensions of 0.76 m diameter and 12 m long and 240 KN weight were usedin January 2000. (table 1) includes a number of research projects have been done.

Modeling

In this paper the influence of parameters of quality anchor model of torpedo anchors under tensile force has been studied in finite element software. The theory of Mohr -