Finite element modeling of suction anchors under combined Loading

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Suction foundations and anchors are used increasingly for fixed and floating offshore structures. They can be used as an alternative to piles and gravity foundations in fixed structures i.e. suction caisson or pile and drag anchors in floating structures i.e. suction anchor. The skirt length to the diameter ratio (L/D) is generally less than one in the suction caissons, which are used in jacket platforms or wind turbines and more than one for the suction anchors, which are used in tension leg platforms (TLPs), or floating structures [1].

Fig. 1. Suction anchor and padeye on the skirt

Suction anchor is a hollow cylinder, open at the bottom and closed at the top as illustrated in Fig.1. It is installed to the seabed initially with self-weight to provide a seal between the foundation's skirt tip and the soil, and then later by pumping out the water from within the skirt. This creates a differential pressure at the top of the caisson and pushes it into the soil.

Suction anchor, depending on the type of the structure, may be subjected to lateral, pull out and inclined loading through a cable which is connected to the load attachment point i.e. padeye on the skirt as shown in Fig. 2.

Padeye depth and cable's angle are important parameters that determine the ultimate capacity of the foundation. Cable angle generally depends on the system of the structure and water depth. For example, it is quasi-vertical in Snorre tension leg platform [2,3], quasi-horizontal in Nkossa process barge [4]. In general, for water depth more than 1000 m, inclined loading is provided by taut wire moorings [5].

The behavior of the suction anchors and piles under inclined and lateral loadings has been the subject of various studies. For the anchors subjected to lateral loading, the capacity of the foundation has been described using a dimensionless lateral unit resistance factor,
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http://www.sciencedirect.com/science/article/pii/S095183390900015X

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