Keying process of OMNI-Max anchor in undrained NC clay

†*J. Liu[1], and D.G. Liu[1]

[1]State Key Laboratory of Coastal and Offshore Engineering, Dalian University of Technology, Dalian, China.

*Presenting author: junliu@dlut.edu.cn
†Corresponding author: junliu@dlut.edu.cn

Abstract

OMNI-Max anchor is a newly developed dynamically penetrating anchor. Once inserted in clay by its self-weight and the kinetic energy from the free fall through the water column, the anchor was rotated/keyed under loading initially and then dove deeper as designed. Positioning in seabed soils is important for OMNI-Max anchor because the working performance of OMNI-Max anchor is closely related to the embedment depth and orientation of OMNI-Max anchor and the properties of the surrounding soils. However, the keying behaviors of OMNI-Max anchor have never been clearly known, especially the trajectory of the anchor in soils. Hence, studying the motion trajectory and capacity are two main issues for the further application of OMNI-Max anchor in offshore engineering.

This paper investigated the development of OMNI-Max's movements during its keying and its pullout capacity in NC clay. A plasticity model of yield envelops was constructed and employed to predict anchor keying behaviors and its capacities. A parametric study on the keying and capacity development of a shallow embedded OMNI-Max in NC clay was performed by the plasticity model due to its simplicity and efficiency. The effects of anchor loading angle, anchor padeye eccentricity, soil strength profiles and chain properties were investigated. The results indicate that undrained shear strength profiles play a key role on the size of yield locus for the shallow anchor, and the parameters of anchor chain has a great influence on the anchor embedment and the bearing capacity.

Keywords: Gravity installed anchors, Numerical modeling, Plasticity model, Offshore foundation.