

Optimization of Jacket Structure in Carbonate Soils

Nanda Kishore Yadla¹, Rama Mohan Gajulapalli², Kandasamy K K³, Faris Kamal⁴

National Petroleum Construction Company

Mussafah, Abu Dhabi, UAE

nanday@npcc.ae; ramavr@npcc.ae; kandasamyk@npcc.ae; farisk@npcc.ae

Extended Abstract

Offshore pile foundations are designed to resist horizontal and vertical loads. Drilled and grouted/pin piles are widely used in the rocky soil strata like Calcarenite. In case of loose sand layers exists in top layers, “sleeve pile” is recommended which acts as a casing while drilling for piles.

Case study presented here is one of the platforms installed in Arabian Gulf. Geotechnical investigation was carried out and reported as loose sand at top 2.3m followed by Calcarenite/Calcisiltite. Due to the presence of loose soil in top layers, soil collapse was anticipated during the drilling through the rock layers. Provision of sleeve piles is a conventional approach to arrest the soil collapse. To accommodate the sleeve pile, jacket leg size needs to be increased by 6 inch from the proposed size and in result more loads induced on the jacket due to additional wave and current forces. Due to this sleeve pile, project cost was escalated and had an impact on schedule also.

To optimise the project cost and time alternate approaches were investigated. Option deliberated in this paper was adopted as an alternate approach to take care of soil collapse. In case of soil collapse, major impact was on (i) mudmat settlement and jacket tilt (ii) hindrance to drilling. Since, sand layer extends to limited depth, i.e 2.3m, soil collapse was not critical for the progress of the drilling beyond 2.3m. Mudmat size was increased such that it could control the settlement and tilt of the jacket due to soil collapse. Geotechnical analyses were carried for soil collapse estimation and settlements were computed with reduced soil parameters due to drilling. Mudmat size was extended beyond the zone of collapse to get enough bearing for the on-bottom conditions and drilling loads. For additional stability of soil, grout was pumped into socket after drilling through sand layer. After the grout stabilisation, socket was redrilled through the grout column.

With the revised mudmat sizes and grout column method, jacket was successfully installed and stable during and after installation of the socket piles. With this new approach, sleeve pile was omitted which in turn saved material, fabrication, and installation cost of the project.