Pile-soil-structure interaction effect on structural response of piled jacket-supported offshore platform through in-place analysis

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Abstract:

In-place analysis for offshore platforms is essentially required to make proper design for new structures and true assessment for existing structures, in addition to the structural integrity of platforms components under the maximum and minimum operating loads when subjected to the environmental conditions. In-place analysis have been executed to check that the structural member with all appurtenance’s robustness have the capability to support the applied loads in either storm or operating conditions. A nonlinear finite element analysis is adopted for the platform structure above the seabed and pile-soil interaction to estimate the in-place behavior of a typical fixed offshore platform. The SACS software is utilized to calculate the dynamic characteristics of the platform model and the response of platform joints then the stresses at selected members, as well as their nodal displacements. The directions of environmental loads and water depth variations have significant effects in the results of the in-place analysis behavior. The most of bending moment responses of the piles are in the first fourth of pile penetration depth from pile head level. The axial deformations of piles in all load combinations cases of all piles are inversely proportional with penetration depth. The largest values of axial soil reaction are shown at the pile tips levels (the maximum penetration level). The most of lateral soil reactions resultant are in the first third of pile penetration depth from pile head level and approximately vanished after that penetration. The influence of the soil-structure interaction on the response of the jacket foundation predicts that the flexible foundation model is necessary to estimate the force responses demands of the offshore platform with a piled jacket-support

Keywords:

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