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Analyzing the Stress and Displacement of the Offshore Platform Affected by Wave Collision

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Abstract

Offshore platform is one of the most important and practical marine structures which are always subjected to strong forces resulted from the flow of water, and oscillating loads caused by waves randomly. Because of the complexity, the structure's conditions and their interaction on fluid, flow pattern and hydrodynamic forces on structures are different, and the presented models and coefficients can't be used for all situations. Therefore, this study simulated the conditions similar to real conditions of a marine platform in the Persian Gulf using Flow3D numerical model and by geometrical, hydrodynamic and structural information. For this purpose, the model was calibrated in terms of the interaction between wave and structure and hydro-dynamically under boundary conditions and proper reticulated conditions; and percent error of the simulation was investigated and determined under existing conditions. Then, maximum displacement values of the structure's elements were determined under different height and period conditions using the results of the simulation. According the results of this study, maximum changes of stress in numerical model showed 32% increase in maximum stress values for 25% increase in the height of waves. Also, 50% increase in the height of waves caused 62% increase in maximum stress for the elements of marine platform structure. The changes of maximum stress in the numerical model showed that maximum stress values were increased 16% by 25% increase in the period of waves. Also, 50% increase in the period of waves caused 30% increase in maximum stress for the elements of marine platform structure.

Keywords: *Offshore platforms, Numerical model, Structure and fluid interaction, Flow3D, Collision of waves.*