The effect of symmetrical and asymmetrical configuration shapes on buckling and fatigue strength analysis of fixed offshore platforms

Muhammad Zubair Muis Alie, author

Abstrak

The fixed jacket is still the most common offshore structure used for drilling and oil production. The structure consists of tubular members interconnected to form a three-dimensional space frame, which can be categorized into a column structure. The structure usually has four to eight legs that are battered to achieve stability against axial compressive loads and toppling due to wave loads. The configuration of a typical member on the jacket structure has significant influence on buckling and fatigue strength. Horizontal and diagonal braces play an important role in resisting the axial compression and wave load on the global structure. This paper discusses the effect of symmetrical and asymmetrical configuration shapes in buckling and fatigue strength analysis on two types of fixed jacket offshore platforms. The axial compressive and lateral (wave) loads were considered and applied to both structures. The material and dimensions of the two structures were assumed to be constant and homogenous. Crack extension and corrosion were not considered. To assess the buckling and fatigue strength of these structures, due to the symmetrical and asymmetrical configuration shape, the finite element method (FEM) was adopted. Buckling analysis was performed on these structures by taking two-dimensional planes into consideration to obtain the critical buckling load for the local plane; fatigue life analysis was then calculated to produce the fatigue life of those structures. The result obtained by FEM was compared with the analytical solution for the critical buckling load. The stress-strain curve was also applied to show the difference between symmetrical and asymmetrical shapes. For fatigue life analysis, the procedure of the response amplitude operator was applied.