TENSION LEG PLATFORM DESIGN: OPTIMIZATION FOR VORTEX INDUCED VIBRATION

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Tension Leg Platform design is a challenging and popular area of research in the offshore oil industry. In order to compete in the International Student Offshore Design Competition (ISODC), a Tension Leg Platform (TLP) was designed. Our TLP design addresses five fundamental areas of technical competency: General Arrangement and Overall Hull/System Design, Weight, Buoyancy, and Stability; Global Loading, Fatigue Strength, and Structural Design; Risk Assessment and Bow-tie Analyses; Structural Analysis, Model Validation, and Verification; and Vortex Induced Vibration (VIV) and Hydrodynamics of Motions and Loading.

Our design optimization process begins with a five-column, four-pontoon tensegrity key platform, operating at a depth of 3,000 ft. Hydrostatic and hydrodynamic analysis of the design iterations are performed by our own MATLAB script. The design optimization process also involves VIV analysis. VIV software such as VIVA and SHEAR7 were used to optimize the design. VIV analysis is an important part of the design process, as it helps to determine if the platform will experience VIV. If the platform is subject to VIV, it may experience fatigue failure. The objective of the VIV analysis is to ensure that the platform will not experience VIV.

The VIV analysis is performed using two sets of commercially viable VIV software: VIVA and SHEAR7. The first set of results is used to determine the natural frequencies and modes of the platform. The second set of results is used to determine the forces and moments acting on the platform. The forces and moments are used to determine the fatigue life of the platform.

The design optimization process involves iterative design changes. The design changes are made based on the results of the VIV analysis. The design changes are made to improve the platform's performance and to reduce the risk of VIV. The design changes are made in a way that the platform will not experience VIV.

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