

**Title of Diploma Thesis**

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Analysis of the Dynamic Behavior of a Tension Leg Platform (TLP)

**Author**

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Lazaros Theodoridis

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**ABSTRACT**

The objective of the present thesis is the analysis of the dynamic behavior of a Tension Leg Platform (TLP). This floating offshore structure type was selected considering the general trend of the last years to exploit oil deposits in deeper waters, which in turn makes the installation of floating oil production platforms a more attractive solution, in terms of cost and efficiency, compared to fixed bottom structures. Furthermore, taking into account the intense technological growth that takes place nowadays in the field of synthetics, the effect of utilizing such materials for the construction of the tendons of the TLP in comparison to steel, the most widely used material for this purpose, was examined.

In the context of this thesis, a TLP was modeled and its dynamic behavior was analyzed, using two different analysis methods: the frequency domain analysis and the uncoupled time domain analysis. For both analysis methods the action of regular waves was considered. The effect of the incident wave characteristics on the dynamic behavior of the TLP was extensively investigated. Specifically, in the case of the frequency domain analysis, the effect of the wave period and the heading angle of the incident wave on the dynamic response of the structure was demonstrated and analyzed. In the case of the uncoupled time domain analysis, the effect of the wave period, the wave height and the heading angle of the incident wave on both the dynamic response of the TLP and the tendons' tension was extensively investigated. Finally, in both analysis methods emphasis was given on the construction material of the TLP tendons and more specifically on the effect of the tendons' material on the dynamic response of the TLP, as well as on its natural periods.

**Keywords:** Floating structures, Numerical modeling, Analysis of the dynamic behavior, Frequency domain, Time domain, Composite materials.