

Title of Diploma Thesis

Time Domain Analysis of a Modular Floating Structure with Flexible Connectors

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ABSTRACT

Pontoon-type Floating Structures (FSs) present a category of marine structures, which can be regarded as one of the most promising candidate alternative solutions for developing modern and sophisticated projects that address new trends and satisfy new needs in the coastal marine environment.

In the context of this thesis the numerical modeling and the corresponding analysis of a moored pontoon-type FS is performed in time domain under the action of perpendicular and oblique regular waves. The examined structure consists of flexibly connected modules that are moored to the seabed with catenary mooring lines. The objective of the thesis is the investigation of the performance of the examined FS considering structural integrity and functionality requirements. The above is implemented through: (a) the calculation of all the physical quantities that describe the dynamic behavior of the FS and (b) the investigation of the effect of the incident wave characteristics on the dynamic behavior, on the structural integrity and on the functionality of the structure.

With regard to the implemented numerical analysis, WAMIT software is, initially, used for calculating the excitation forces, the radiation damping and the added mass (frequency dependent quantities). Then, the time domain analysis is implemented through the application of MULTISIM considering as inputs the geometrical characteristic of the modules, the characteristics of the mooring system (number of mooring lines, type, length and modulus of elasticity of each mooring line), the connectors' characteristics, the incident wave characteristics as well as the aforementioned physical quantities calculated in WAMIT.

Finally, the results of the numerical analysis (tensions of mooring lines, connectors' forces and response of the floating modules) are assessed taking into account specific structural integrity criteria based on guidelines as well as functionality requirements, considering that the examined FS can be used as a floating pier.

Keywords: Moored pontoon-type floating structure, Flexibly connected modules, Numerical modeling, Dynamic behavior, Floating pier.