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Conceptual Design of Panel Based Reinforced Concrete Floating Substructure for 10 MW Offshore Wind Turbine

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Abstract : During the past few years, offshore wind energy has become the key parameter to reduce carbon emissions. In most of the previous studies, floaters in floating offshore wind turbines (FOWT) are made up of steel. However, fatigue and corrosion are always major concerns of steel marine structures. Recently, researchers are working on concrete floating substructures. In this paper, the conceptual design of pre-cast panel-based economical and durable reinforced concrete floating substructure for a 10 MW offshore wind turbine is proposed. The new geometrical shape, i.e., hexagon with inside hollow boxes, is proposed under static conditions. To design the outer panel/side walls to resist hydrostatic forces, special consideration for durability is given to limit the crack width within permissible range under service limit state. A comprehensive system is proposed for transferring the ultimate moment and shear due to strong wind at the connection between steel tower and concrete floating substructure. Moreover, a stable connection is also designed considering the fatigue of concrete and steel due to the fluctuation of stress from the mooring line. This conceptual design will be verified by subsequent dynamic analysis soon.

Keywords : cracks width control, mooring line, reinforced concrete floater, steel tower
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