

Solutions for Large Diameter Piles Stiffness Used in Offshore Wind Turbine Farms

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Abstract : As known, many countries are now planning to build new wind farms with high capacity up to 5MW. Consequently, the size of the foundation increase. These kinds of structures are subject to fatigue damage from environmental loading mainly due to wind and waves as well as from cyclic loading imposed through the rotational frequency (1P) through mass and aerodynamic imbalances and from the blade passing frequency (3P) of the wind turbine which make them behavior dynamically very sensitive. That is why natural frequency must be determined with accuracy from the existing data of the soil and the foundation stiffness sources of uncertainties, to avoid the resonance of the system. This paper presents analytical expressions of stiffness foundation with large diameter in linear soil behavior in different soil stiffness profile. To check the accuracy of the proposed formulas, a mathematical model approach based on non-dimensional parameters is used to calculate the natural frequency taking into account the soil structure interaction (SSI) compared with the p-y method and measured frequency in the North Sea Wind farms.

Keywords : offshore wind turbines, semi analytical FE analysis, p-y curves, piles foundations

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