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Cost efficient design of grouted joint of fixed bottom offshore wind turbine

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ABSTRACT

In the present dissertation, a finite element analysis of two model types that simulate the grouted connection of a monopile foundation of an offshore wind turbine of fixed bottom is performed. The aim of the project is the generation of new models in order to find solutions and to present proposals for improvement of the current grouted connection practices. In the beginning, an introduction is presented on the wind turbines and the types of foundation used. Subsequently the properties and the characteristics of the grout are given that are used as means of connection between the pile and the transition piece. Furthermore, the properties of the elastomer, i.e. the material that is proposed as a solution for the connection, are presented. Then, analysis is performed for the two finite element models. The models are validated by comparing the two model types and then are used for the analysis of the proposed solutions. These solutions are: combined use of grout and elastomers at the critical zones and use of elastomer throughout the connection. The strength of the materials of these solutions are examined. Then, the existing construction methods of a monopile foundation are discussed along with the proposed ones. The proposed ones include these of cast elastomer and of pieces of elastomer. Finally, a cost analysis is performed. The grouted connection is examined as well as the proposed solutions. In conclusion, the use of elastomer material at the connection is feasible and the proposed connection of cast elastomer is the most feasible and economical.

KEYWORDS: offshore wind turbine, grouted connection, elastomer material, construction methods, cost analysis