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Design and construction methods of offshore with turbines of fixed bottom tripod type

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ABSTRACT

This thesis fulfils part of the requirements of the Graduate Program in Project Management, in the Department of Civil Engineering of the School of Engineering of the Aristotle University of Thessaloniki. The objective of the thesis is the exploitation of wind energy through offshore wind farms. In this context, initially, several data for the energy production potential are presented, focusing on the wind power. Subsequently, a brief presentation is given on the characteristics and the functionality of the wind turbine engines as well as of their supporting structure types. The motives of the modern technological trends in the wind energy industry that seem to push for building wind farms with larger wind turbines in offshore areas are discussed. The regulations and standards, which currently govern the design and construction of these structures are highlighted. The core of the thesis is concerned with the design process and construction methods of an offshore wind turbine of fixed bottom tripod type. An attempt is made to address all the factors that affect a structure of this type, including: The dynamic load of the rotor and the environmental loads, i.e. waves, currents, wind, and earthquake. Static and dynamic analysis is performed and the results are presented and discussed, followed by member and joint check and resizing of the structural members.

Finally, construction methods and construction scheduling for a wind farm are presented; both show the necessity of a close cooperation between design, manufacturing, fabrication, transportation and installation phases of such a project from the initial concept to the final realization. The design process used various software tools, the most important being the structural analysis program MicroSAS, a software package developed by McDermott, Inc., which is an established standard in the offshore petroleum industry.

KEYWORDS

Wind energy, Energy, Renewable resources, Wind turbine/s offshore