Reliability assessment of fatigue critical welded details in wind turbine jacket support structures - DTU Orbit (17/01/2019)

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This paper describes a probabilistic approach to reliability assessment of fatigue critical welded details in jacket support structures for offshore wind turbines. The analysis of the jacket response to the operational loads is performed using Finite Element Method (FEM) simulations in SIMULIA Abaqus. Fatigue stress cycles are computed on the jacket members by applying tower top loads from an aeroelastic simulation with superimposed marine loads and in accordance to the IEC-61400-3 guidelines for operational conditions. The combined effect of the hydrodynamic loads and the rotor loads on the jacket structure is analyzed in a de-coupled scheme, but including the structural dynamics of the support structure. The failure prediction of the welded joints, connecting the individual members of the support structure is based on SN-curves and Miners rule according to ISO 19902 and DNV-RP-C203/DNV-OS-J101. Probabilistic SN-curves and a stochastic model for Miners rule is used to estimate the reliability of selected critical welded details in the jacket structure taken into account the uncertainty in the fatigue stresses.

General information
State: Published
Organisations: Department of Wind Energy, Wind Turbines, Aalborg University
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Number of pages: 9
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the ASME 2013 32nd International Conference on Ocean, Offshore and Arctic Engineering
Publisher: American Society of Mechanical Engineers
Article number: OMAE2013-11398
Source: dtu
Source-ID: u::8080
Research output: Research - peer-review › Article in proceedings – Annual report year: 2013