RAMBØLL

ENERGY

05.09.2019

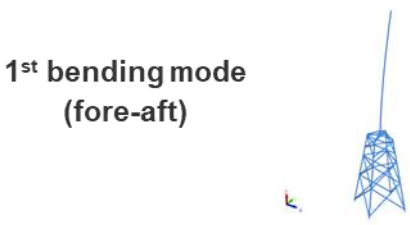
OPERATIONAL MODAL ANALYSIS FOR MONITORING OF OFFSHORE WIND JACKETS

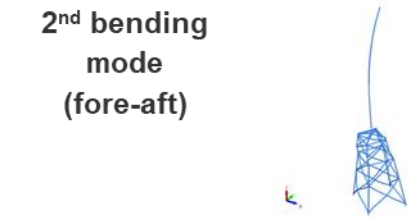
MASTER THESIS

Structural Health Monitoring aims to detect structural damages and thereby guarantee the safety of the asset or enable condition-based maintenance strategies and potential lifetime-extension. One approach relies on monitoring of modal parameters such as natural frequencies, damping and mode shapes.

Operational Modal Analysis (OMA) can be used to extract modal parameters of a system subjected to ambient vibrations based on acceleration measurements at several locations. Challenges in applying OMA to offshore wind substructures are found in the combination of natural excitations (wind, wave, current), very transient conditions and low energy content in specific mode shapes of the structure.

The goal of the master thesis is to benchmark different OMA methods to identify suitable approaches for monitoring offshore wind jackets. Therefore, common methods such as Frequency Domain Decomposition and Stochastic Subspace Identification as well as selected new approaches from latest research shall be investigated. The work is executed under the H2020 research project "ROMEO", where the offshore wind farm Wikinger is used as demonstrator project. Ramboll will provide extensive measurement data for benchmarking of OMA methods. Testing of methods is expected to be conducted in the commercial software ARTeMIS, Open Source software identified during the work and (preferably) directly in Python.





The scope of works consists of the following steps:

1. Conduct a literature review
2. Identify suitable OMA methods to be tested
3. Develop and implement OMA methods and analysis routines
4. Investigate impact of boundary conditions and OMA settings
5. Perform benchmarking to identify strengths and weaknesses of tested methods

The candidate executing the work has strong mathematical skills and experience in programming languages such as Python, Matlab or similar. General knowledge of vibration theory, structural engineering and wind energy is an advantage.

Location:	Ramboll Offices, Chilehaus 13, 20097 Hamburg
Timeframe:	6 months, as soon as possible
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