On the damage detection of a laboratory scale model of a tripod supporting structure by vibration-based methods

The paper presents a comparison of two vibration-based methods for the damage detection of a laboratory scale model of a tripod. Tripods are a part of the supporting structures for offshore wind turbines. The tripod model structure allows the investigation of the propagation of a circumferential representative crack in one of the cylindrical upper braces of the tripod itself. The first damage detection method addresses the use of acceleration signals in a genuine experimental modal analysis (i.e. input-output modal analysis) while the second one is based on operational modal analysis (i.e. output only modal analysis). The progressive damage is monitored by the calculation of the modal parameters and following their deviations. Both methods were performed on the undamaged and damaged structure for different support conditions and excitations (shaker, hammer, in water basin under wave excitation). The results suggest that both the methods can be considered useful tools for damage detection in dry and in-water conditions for offshore support structures. The presented technique proves to be effective for detecting and assessing the presence of representative cracks.

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