



## Hydrodynamic assessment of Wind Turbine Installation Vessels

A Wind Turbine Installation Vessel (WTIV) is a complex and hybrid vessel: during its operations it transforms from a vessel to a platform and vice versa on a regular basis. MARIN can assist you to determine the operational performance of your Wind Turbine Installation Vessel from a hydrodynamic point of view, both in the design phase as well as in daily operations.

### Services for Wind Turbine Installation Vessels:

- Hull & Propulsion optimization
- Vessel motions/ Crew comfort
- Jack-up leg impact load analysis
- DP station keeping accuracy analysis
- Operability analysis
- Training of crews on full mission bridge simulator
- Tools to support onboard daily operations

### *Conceptual phase: conceptual design and initial operability analysis*

In the conceptual phase of the design MARIN can assist with hydrodynamic and conceptual advice on the new design based on its experience with model testing and numerical assessment of Wind Turbine Installation Vessels and other complex vessels. Furthermore an initial operability analysis can be performed to determine economic feasibility of your new vessel concept.

### *Design phase: hydrodynamic assessment of the WTIV design*

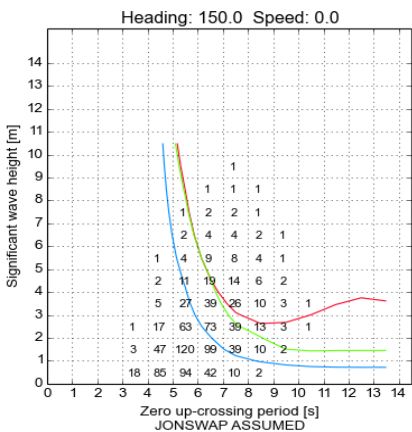
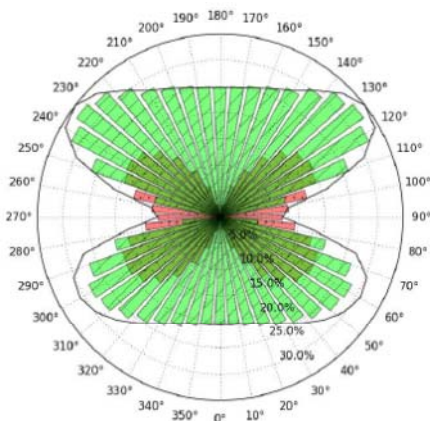
In the design phase MARIN can assist in the following by means of numerical simulations and/ or model testing of your Wind Turbine Installation Vessel design:

- Hull & propulsion optimization: optimization of the hull design to minimize resistance and maximize sailing speed.
- Motion analysis: the motion characteristics of the vessel are of direct influence on the operational performance. The more favorable the motions the lower the loads on the legs at the moment of touch-down

and the easier to perform operations. The results of the motion analysis will be used in leg impact load analysis and operability (uptime/ downtime) analysis.

- For jack-up type Wind Turbine Installation Vessels one of the most critical stages in the whole operation is the moment of touch-down, when the WTIV transforms from a vessel to a platform. The interaction between the legs and the seabed result in high loads on the





Screenshots OperabilityViewer

**Related products:**

- Performance analysis for wind turbine support vessels
- Optimization for gangway operations
- Optimization of boat landing alignment

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legs and the jacking structure. MARIN has successfully completed the WindJack Joint Industry Projects (JIP), to determine these seabed impact loads. The findings and tools from this JIP will be used to determine the impact loads on the legs and take these into account in the operability analysis.

- DP station keeping accuracy analysis: assessment of the Dynamic Positioning (DP) station keeping accuracy while jacking on location for intact and thruster failure configurations.
- Operability analysis: to determine the economic feasibility of your Wind Turbine Installation Vessel the operability (uptime/ downtime) of the vessel will be quantified. The different hydrodynamic stages the vessel is working in are taken into account in this analysis. The results of this analysis will be delivered in combination with MARIN's easy-to-use OperabilityViewer, allowing to determine the operability of your vessel based on your operational criteria and local scatter diagram.
- Training of crews on full mission bridge simulator: In our full mission bridge simulator we provide interactive real time trainings for complex operations. Downtime of the operations is to be minimized by increasing the efficiency of the operation. Realistic offshore operations are simulated in order to train the crew to act in these situations.

**Operational phase: Tools to support onboard daily operations**

MARIN can develop onboard numerical tools together with you to optimise daily operations. An operating procedure can be developed to support the operator in selecting the optimum configuration and heading to minimize the loads on the legs at the moment of touch-down based on the actual environmental combination of current, wind and waves.

**Expertise and experience**

MARIN is an independent and innovative service provider specialising in hydrodynamic assessments and investigations. With over 80 years experience, we are fully conversant with challenging metocean conditions in Oil & Gas and renewable energy projects worldwide. MARIN offers services for hydrodynamic analysis of various types of installations and operations offshore. Our expertise includes concept validation, slamming, operability of jack up installation and maintenance vessels, motion compensation, mooring, dynamic positioning and logistic scenario analysis.