



## 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. Furthermore state-of-the-art WTIVs are equipped with complex motion control systems. MARIN can assist you to determine the operational performance of your Wind Turbine Installation Vessel, both in the design phase as well as in daily operations.

### Services for Wind Turbine Installation Vessels:

- Hull & Propulsion optimization
- Vessel motions / Crew comfort
- DP station keeping accuracy analysis
- Operability analysis including jack-up ability
- Evaluation of motion control systems
- Interactive simulation for training and assessment
- Tools to support onboard daily operations

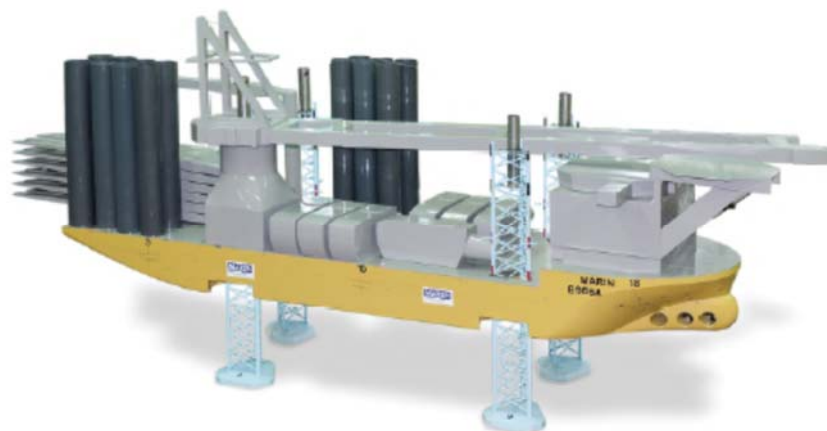
### *Conceptual phase: conceptual design and initial operability analysis*

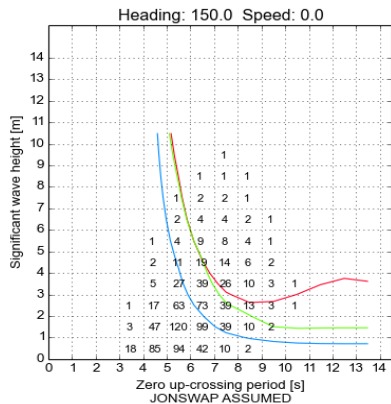
In the conceptual phase of the design MARIN can assist with hydrodynamic and conceptual advice on the new design based on its experience with model testing and numerical assessment of Wind Turbine Installation Vessels and other complex vessels or onboard systems. Furthermore an initial operability analysis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

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

In the design and evaluation 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.
- Seakeeping 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 can be used in leg impact load analysis and operability (uptime/ downtime) analysis.
  - DP station keeping accuracy analysis: assessment of the Dynamic Positioning (DP) station keeping accuracy while jacking on location or while keeping station on DP during the operation.





Screenshot OperabilityViewer



Interactive training simulator

#### Related products:

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

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- Evaluation of motion control systems: novel motion control systems are more and more applied onboard of offshore operation vessels to enhance operability and safety. Time to market, energy efficiency and performance are key elements for the design of new systems. The development and evaluation of such systems can be a long and fragmented track. We assist in the development and evaluation by means of numerical operability analysis, demonstration model tests and interactive training simulators. We facilitate a stepwise, hybrid development and evaluation method to speed up the development.
- 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.
- Interactive simulation:: Downtime of the installation operations can be reduced by increasing the efficiency of the operation and crew performance. Interactive real-time simulations can assist in achieving this goal. Our full-mission bridge simulator offers an environment to execute a variety of complex offshore operations realistically, including crane operations. Alternatively, we offer human-in-the-loop simulators in various formats for procedural training or assessment in your office environment.

#### 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.