

# Performance analysis for wind turbine support vessels

The operational performance of wind turbine support vessels depends on the seakeeping characteristics of the vessel and the resulting wellbeing of the technicians on-board. MARIN can calculate this for you with its existing hydrodynamic software's. The results will be delivered to you in combination with one of MARIN's dedicated visualizes: OperabilityViewer or PerformancePlotViewer, allowing to determine the operability of your vessel and present it in easy-to-use and interpret plots.

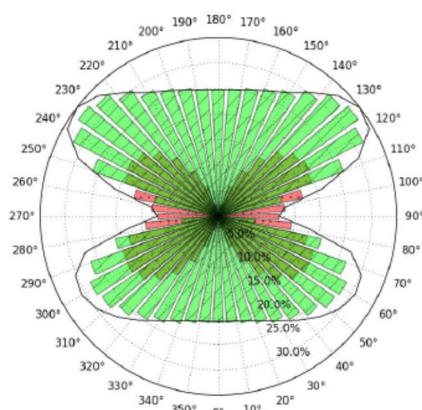
## Services for hydrodynamic performance analysis:

- Concept/ Design phase:  
Determine the uptime/ downtime of your vessel
- Operational phase:  
Determine if the operation can be performed on a daily basis. Onboard decision support of daily operations
- Wind farm maintenance strategy:  
Determine the uptime/ downtime of your vessel for a specific wind park

## Assessing the operability of your wind turbine support vessel

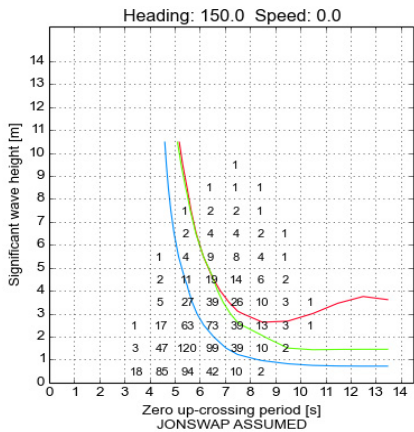
O&M operations for the offshore wind industry contribute significantly to the lifecycle cost of energy. Therefore the market demands solutions such that maintenance uptime is increased. A thorough assessment of the operability (uptime/ downtime) of your vessel concept or design allows to optimise the design for operations. Furthermore, the results of the performance analysis can be used as well to determine if the transit and transfer operations can be performed on a daily basis.

The hydrodynamic analysis will be performed by MARIN with its existing hydrodynamic software's and based on more than 80 years of expertise in hydrodynamic analysis and model testing. The analysis will be performed for both the transit as well as the transfer phase. The results of the analysis will be delivered in combination with MARIN's OperabilityViewer and PerformancePlotViewer, both easy-to-use tools to determine and visualize the operability. Based on your user defined operational criteria, for example for roll or human comfort, the operational limits of the vessel are determined. The operability can be presented by a scatter diagram including uptime/ downtime lines in MARIN's OperabilityViewer or in industrial standard performance plots, so-called P-plots, by MARIN's PerformancePlotViewer.

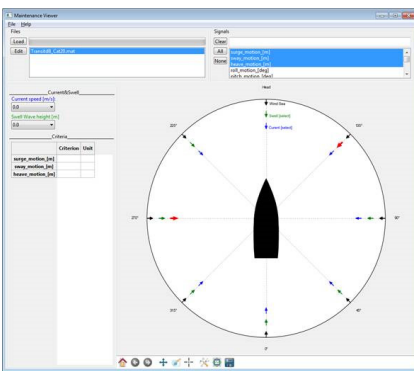


## Concept/ Design phase: Hydrodynamic performance analysis

In the design phase of a vessel one wants to know the seakeeping characteristics and associated operational performance of the vessel. This can effectively be assessed by means of numerical simulations.



Screenshot OperabilityViewer



Screenshot PerformancePlotViewer

### Related products:

- Services for wind turbine installations
- Optimization for gangway operations
- Optimization of boat landing alignment

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The simulations will be performed for both the transit as well as for the transfer stages, since the seakeeping characteristics and operational criteria in both stages, with and without forward speed, are different. In the transit stage the focus is on human comfort and seasickness of the technicians, while the transfer stage the focus is on the safe transfer of technicians between the vessel and the wind turbine.

The simulations can be performed for 20 to 30 m Crew Transfer Vessels (CTV's) as well as larger Offshore Service Vessels (OSV's). Both types of vessels require a dedicated calculation approach and software's.

### Operational phase: Support in daily operations

The results of the numerical hydrodynamic performance analysis of the final design can be used in MARIN's PerformancePlotViewer to determine if a transit or transfer operation can be performed within user defined operational criteria. This tool can be used on a day-to-day basis in combination with short term weather predictions or onboard to judge the feasibility of the operation.

### Wind farm maintenance strategy: Calculating the average uptime/ downtime

The results of the numerical hydrodynamic performance analysis can also be used in MARIN's OperabilityViewer to determine the uptime/ downtime of your vessel in a specific wind park. Based on a user defined scatter diagram the monthly or annual uptime/ downtime is calculated. This information is an essential input for annual maintenance planning and to the overall maintenance strategy of the offshore wind farm.

### State of the art tools

Use will be made of MARIN's existing state-of-the-art hydrodynamic software's to calculate the performance of your vessel. The applied software's include: Precal, Diffrac, PANSHIP and aNySIM-xmf. The results of these dedicated hydrodynamic performance simulations will delivered in combination with MARIN's easy-to-use visualizes PerformancePlotViewer or OperabilityViewer, allowing to determine the operability of your vessel based on user defined criteria.

### 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.