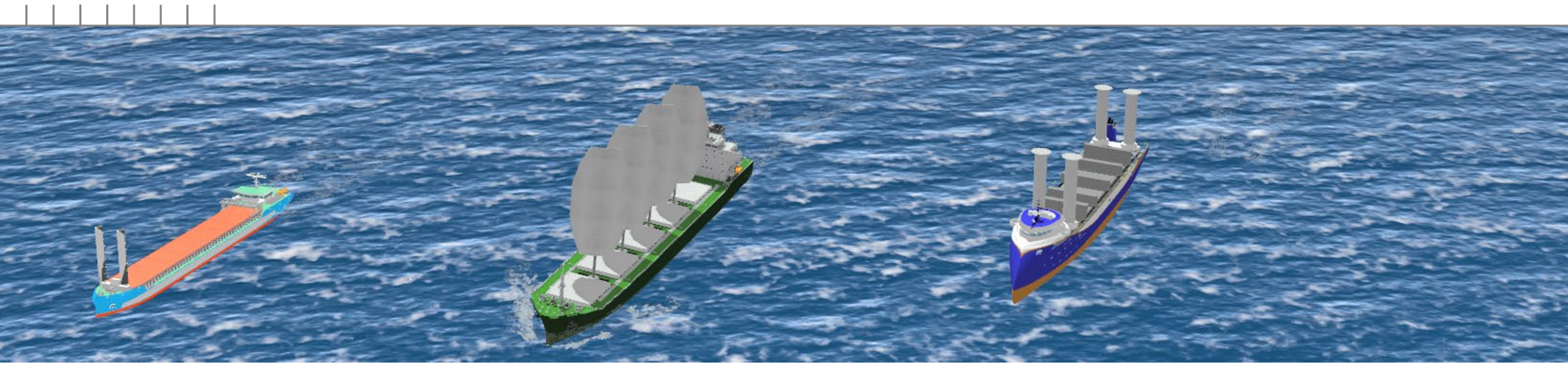
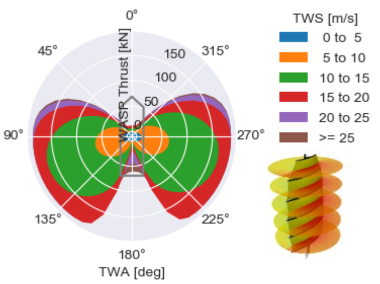


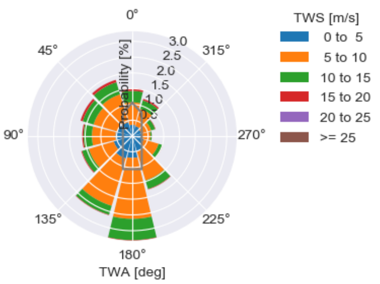
Wind Propulsion | Quick Feasibility and Concept Study

May wind propulsion help your vessel/design and which concepts are available to consider?

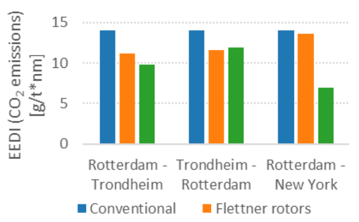
1 Performance (Thrust & Power)



2 Wind statistics



3 Overall fuel/emission performance



Wind propulsion can result in substantial savings in fuel consumption and exhaust gas emissions. Demonstration projects have shown that savings of 5% to 15% are immediately achievable in average wind conditions without really changing operations and ship design.

However, development projects presently underway indicate that with changed design and operations those savings can be highly increased, getting close to 80% to 90% savings in favourable wind. This is a very interesting prospect for shipping. Wind propulsion can deliver savings that are out of range for other technologies. It can also reduce the operational cost that is inevitably involved with carbon free / neutral fuels.

The first step to judge whether wind propulsion is also relevant for your ship design and operation is to do a feasibility and concept study; experimenting with different device types and arrangements. This study allows to quickly and cost efficiently find out whether and how wind propulsion may help your design. It may be followed up by further design, optimisation and verification studies. See our leaflet on Optimisation and Verification.

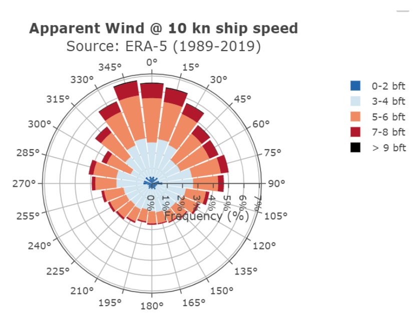
The starting point for such a study is to define the ship or fleet, routes and ship speed(s). A small selection of wind propulsion configurations (types & dimensioning) are proposed by MARIN and confirmed by the client, keeping in mind any relevant constraints.

The study follows the EEDI/EEXI framework (MEPC.1/Circ.896), but makes a number of improvements that have shown to be important for accuracy of the prediction. The methods are further improved with the findings of the WiSP2 Joint Industry Project.

Key points

- Quick (standardised) study
- Follows EEDI/EEXI
- Potential for fuel/CO_2 emission reductions for your specific route and operations
- Identifies promising lay-outs and wind propulsion types and any points of attention.

Route interface on BlueRoute



Apparent wind statistics per route, speed and season

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Check also our website for other and newer publications and our leaflet on Optimisation and Verification of Wind propulsion.

Step 1: Performance prediction (PPP)

Based on the type and dimension of wind propulsors, the forces are estimated as function of wind speed and angle. The wind propulsion settings (trim, reefing, rotation rate, etc.) are optimised for each wind condition, accounting also for any power required for active devices such as Flettner rotors and suction sails. Constraints, e.g. on heel, are included. The change in efficiency of the conventional propulsion and the resistance of the ship on account of leeway are included as necessary, depending on the proportion of wind assistance. The result is a full Performance Prediction Program (PPP), describing the remaining propeller thrust, power, fuel consumption and CO2 emissions as function of wind angle and speed.

Step 2: Wind statistics

Wind statistics are gathered for the relevant route(s) either from existing databases or from measurements delivered by the client.

Step 3: Overall performance

Getting the overall performance is a matter of multiplying the performance matrix from the PPP with the wind statistics matrix. The result is the average fuel and emission performance, which is be split out per ship, wind propulsion configuration, route and speed. The results are uploaded to a private space on BlueRoute, allowing you to interactively assess apparent wind and performance on arbitrary routes and alternative speeds.

Track record & research

Since 2011 MARIN has been actively engaged in research to support the (re-) implementation of wind propulsion in commercial shipping with various EU projects, Joint Industry Projects, IMO MEPC contributions and direct service to clients. At present MARIN is involved in the following (public) initiatives:

- WiSP2 Joint Industry Project (with BlueRoute performance prediction)
- ITTC Committee on Performance of Wind Powered and Wind Assisted Ships
- Optiwise EU Research project to rethink ship design and operations.

References

[1] M. Garenaux and J. J. A. Schot; “Flettner rotors performance and interaction effects on the MARIN Hybrid Transition Coaster”, RINA Wind Propulsion Conference, London, 2021.

[2] R. Eggers and A. S. Kisjes; “Seakeeping and Manoeuvring for Wind Assisted Ships”, RINA Wind Propulsion Conference, London, 2019.