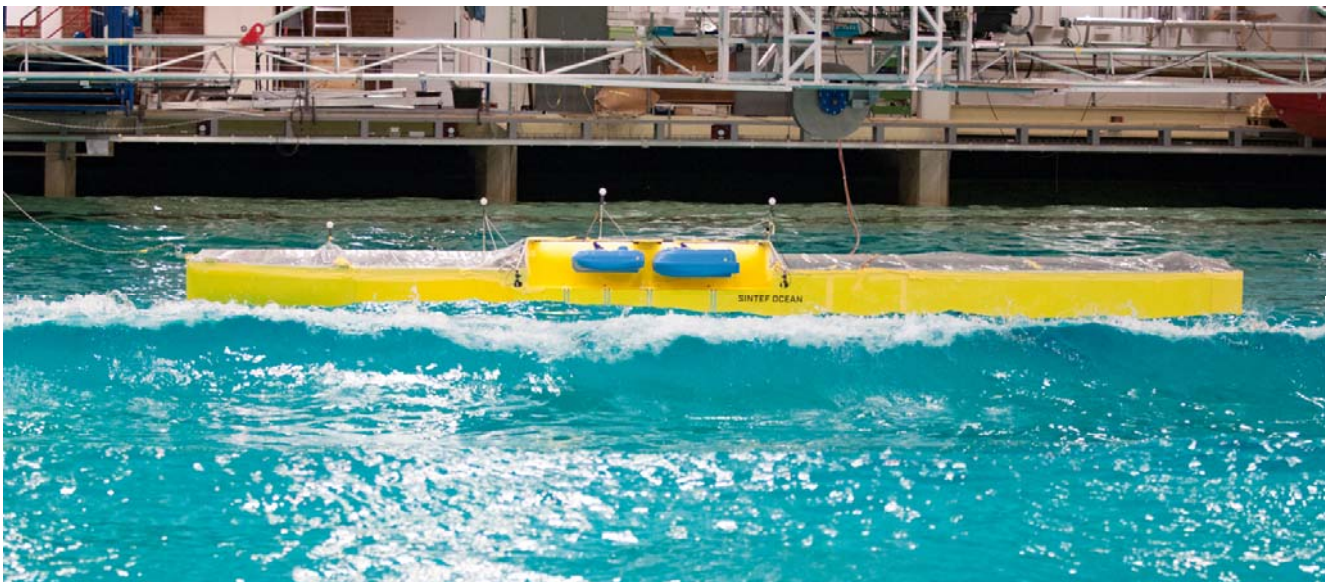
Performance in a Seaway

Our unique combination of laboratory capabilities, software development, access to numerical tools and multidisciplinary expertise enables us to undertake projects ranging from quick analyses of design details to complex studies of vessels.



SAFE RETURN TO PORT (SRTP)

SOLAS II-23/Reg.21.1 states «Passenger ships constructed on or after 1 July 2010 having length, as defined in regulation II-1/2.5, of 120 m or more or having three or more main vertical zones shall comply with the provisions of this regulation.»

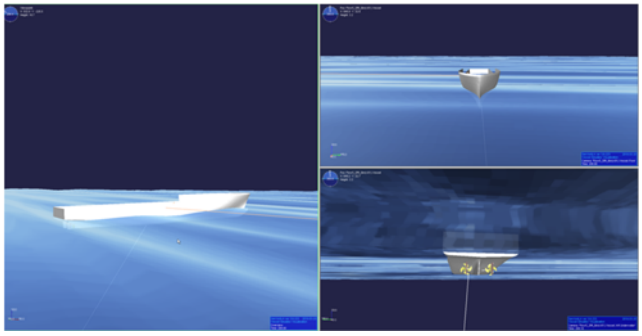
SINTEF Ocean can assist in ensuring that vessels have sufficient available power and torque to maintain speed in a specific weather condition (in head seas).

There are several calculation steps required to find the required power and torque to maintain 6 knots in a sea state.

SINTEF Ocean has both simple conservative methods, and high-fidelity advanced model test and simulation methods at its disposal. We can assist at the concept stage with simple tools. Should the results indicate that the requirements are not met, advanced model tests and time domain simulations would be the natural next step in the analysis.

Our main calculation methods are;

1) Calculation of mean forces, power and torque can be conducted in the frequency domain.
2) A higher level of fidelity is offered through time domain simulation using our vessel simulator, VeSim. This method allows for finding mean forces, power and torque from the time series output. It allows for investigating, for instance, speed fluctuations and maximum values, not only mean values.



Typically, frequency domain methods are overly conservative, so a refined time domain approach can open up cost saving possibilities for a designer.

For both mentioned methods, the added resistance can by several available methods:

i. Calculating added resistance transfer functions (VERES G&B, CFD, 3D panel codes, STA2, etc.)

ii. Using towing model tests in waves for establishing the added resistance in waves

3) Propulsion model tests with a free running model with autopilot. The model tests are set up to represent the complete SRtP condition. If it is a twin-screw vessel, the inactive propeller can be either locked, water-milling or removed. An air fan applies the wind force, as well as friction corrections (towrope force).

MINIMUM POWER REQUIREMENTS

IMO Res. MEPC.232 «minimum required propulsion power» requires sufficient installed propulsion power to maintain manoeuvrability in adverse conditions. It is applicable to oil tankers, bulk carriers and combination carriers having more than 20,000 DWT.

SINTEF Ocean can assist in performing these calculations using the same tools as for the SRtP calculations from simple, slightly conservative methods, to high fidelity methods as time-domain simulations (VeSim) or model tests.

CONCEPT STUDIES AND PERFORMANCE IN WIND AND WAVES

Ships are traditionally optimized for operation in calm water, at design draught. In recent years, however, the focus on power consumption in wind and waves have increased. SINTEF Ocean can assist at several levels of investigation on how to improve vessel efficiency in wind and waves. Parametric studies of a vessel's main characteristics, for example, can be done by numerical calculations. At the other end of the scale, examination of how design details will affect the overall power consumption in operation is best studied by applying a combination of model tests, calculations and use of operational and meteorological data.

EVALUATION OF SAFETY, OPERABILITY, AND COMFORT

Motions and accelerations experienced by a vessel in a seaway affect operability, safety and comfort, as well as integrity of the cargo. SINTEF Ocean has well-established experimental and numerical tools for the evaluation of motions and accelerations in waves. Operability studies based on custom-defined criteria and relevant meteorological data provide the opportunity to easily compare different concepts and give valuable insights into which parameters are driving the operability limits and how, for example, changing the service speed affects operability. Tuning numerical models to model test results makes it possible to combine high accuracy with short computation time.

NEW TEST RIG AT SINTEF OCEAN

A new test rig allows for high quality measurements in an efficient setup for performance tests in waves. The rig is installed in front of the towing carriage, and is equipped for towing and self-propelled tests. The rig allows for atomized testing (tracking of model, wave generation, data recording and video). This streamlines the extension of «standard documentation tests» to include powering performance in waves.

SINTEF OCEAN

SINTEF Ocean has more than 75 years of experience in ship model testing. Ship performance in wind, waves and current is part of our routine design investigations in both physical and numerical laboratories. Our unique combination of laboratory capabilities, software development, access to numerical tools and multidisciplinary expertise enables us to undertake projects ranging from quick analyses of design details to complex studies of vessels.

SINTEF

CONTACT:

Sverre Anders Alterskjær
+47 41 68 81 91
sverre.alterskjaer@sintef.no