

MARINTEK

Hydrodynamic Laboratories

Technical specifications and testing facilities



- Ocean Basin Laboratory
- Towing Tanks
- Cavitation Laboratory

The Ocean Basin Laboratory

Test facilities

The Ocean Basin Laboratory is used for studying basic as well as applied ship and offshore problems.

A total environmental simulation including wind, waves and current offers unique testing conditions for models of all types of fixed and floating structures.

A water depth of 10 metres offers excellent testing possibilities for deep water structures intended for the offshore industry in future.

Applications

- Seakeeping
- Ship manoeuvring
- Fixed and floating structures
- Mooring systems
- Energy production from the sea
- Floating islands
- Offshore loading systems
- Offshore floating production
- Offshore marine operations
- Subsea systems and operations
- Pipelines

Ocean basin laboratory data

Length: 80 m
Width: 50 m
Depth: 0-10 m

Maximum current velocity approx. 0.2 m/s at 5 m water depth.
Down at 7.5 m water depth maximum current velocity is approx. 0.15 m/s.

Double flap wave maker

Hydraulic driven, hinged double-flap type.

Wave characteristics:

Regular waves. Maximum wave height: 0.9 m.

Wave periods: 0.8 s and above.

Wave spectra: Computer generated or from magnetic tape.

Multiflap wave maker

Electrically driven, hinged single-flap type.

144 individually controlled flaps.

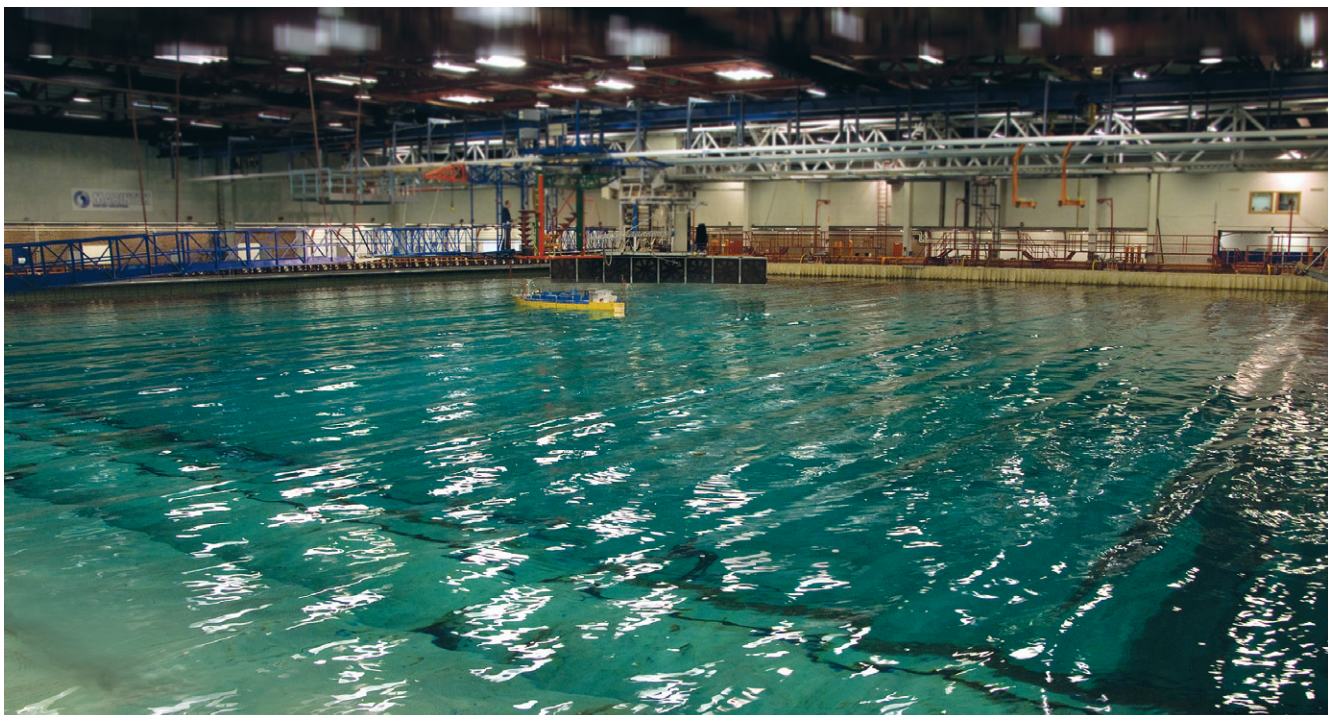
Wave characteristics:

Regular waves: Maximum wave height: 0.4 m.

Wave periods: 0.6 s and above.

Wave spectra: Computer generated shortcrested or longcrested waves of specified direction.

The carriage system follows free running models with no constraints at speed up to 5 m/s, at any heading to the waves.



The Towing Tanks

Towing tanks I and III

Tank I and III can be used simultaneously and also as one long tank (I+III) by removing a gate. Both regular and irregular waves can be simulated. The tanks are equipped with two carriages: One for towing up to 10 m/s for traditional calm water tests and a second carriage for seakeeping tests and other tests performed with fixed or free-running models. In tank I+III either of the two carriages can be used.

Main tests performed in towing tanks I and III

- Resistance, open water, propulsion tests, 3D wake measurements
- Seakeeping tests (motions, sea loads, slamming, whipping, active control)
- Manoeuvring (zig-zag tests, Planar Motion Mechanism PMM tests)
- Directional stability tests
- Crabbing tests
- Dynamic positioning tests
- Ship-Ship interaction tests
- Forced motion tests

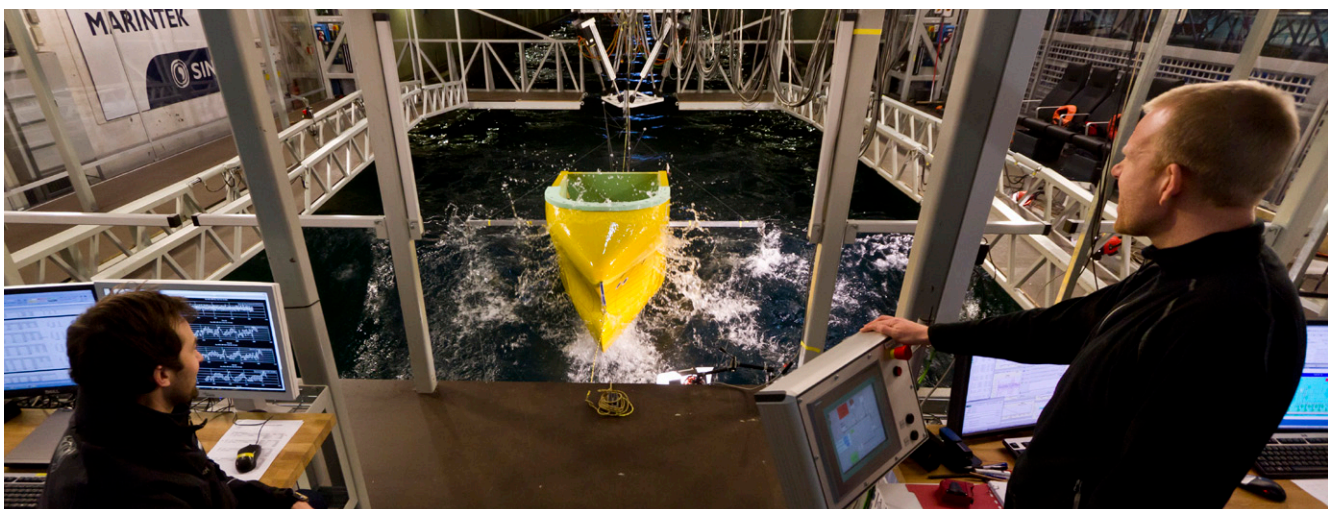
- Lifeboat drop tests
- Measurement of current forces on offshore structures
- Measurement of forces and moments in six degrees of freedom
- Measurement of displacement in six degrees of freedom
- Propeller blade loading measurements
- Six-component propeller shaft measurements
- Propeller nozzle loading measurements.
- Tests using yacht dynamometer
- Various Pod / Azimuth thruster tests
- High speed video recordings (above and under water)

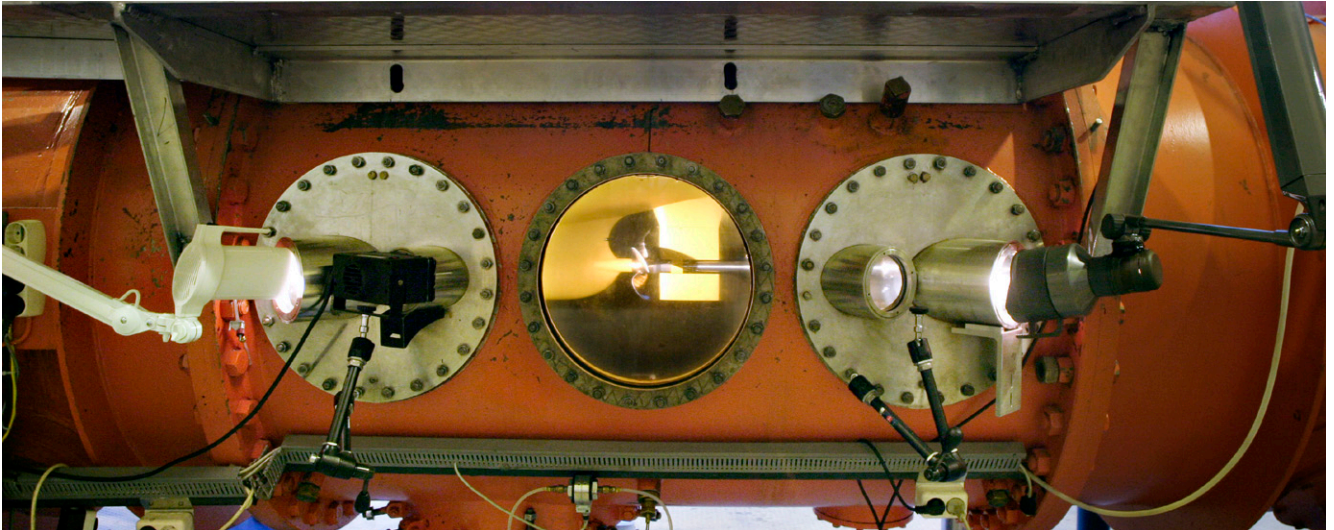
Cybernetics laboratory

The Marine Cybernetics Laboratory is a small wave basin, which is especially suited for tests of marine control systems, due to the relatively small size and advanced instrumentation package. It is also suitable for more specialized hydrodynamic tests (for example forced motion tests), mainly due to the advanced towing carriage, which has capability for precise movement of models in 6 degrees of freedom. Flow field measurements can be performed using Particle Image Velocimetry PIV technique.

Towing tanks and carriages data

	Tank I + III*	Tank I	Tank III	MC-Lab
Length:	260 metres	175 metres	85 metres	39 metres
Width:	10.5 metres	10.5 metres	10.5 metres	6.45 metres
Depth:	5.6/10.0 metres	5.6 metres	10 metres	1.5 metres
Maximum speed:	10 m/sec.	10 m/sec.	5 m/sec.	2 m/sec.
Maximum acceleration:	1 m/sec. ²	1 m/sec. ²	1 m/sec. ²	1 m/sec. ²
Model size range:	8 metres	8 metres	8 metres	2 metres
Wavemaker:	Double flap		Double flap	One flap
Maximum wave height:	0.9 metre		0.9 metre	0.25 metre
Wave period range:	0.8-5 sec.		0.8-5 sec.	0.3-3 sec.
Maximum wave steepness:	1:10		1:10	1:10





The Cavitation Laboratory

Cavitation tunnel data

Height between center lines: 10 metres
 Width between center lines: 22.22 metres
 Contraction area ratio: 6.25
 Diameter of working section: 1.20 metre
 Length of working section: 2.08 metres
 Type of working section: Closed throat
 Maximum water velocity: 18 m/sec.
 Maximum propeller RPM: 3000
 Propeller motor power: 50 KW
 Maximum working pressure: 6.0 atm.abs.
 Minimum working pressure: 0.1 atm.abs./ $\sigma_v=0.2$
 Impeller motor power: 1250 KW
 Honeycomb for flow straightening.

Test activities

- Open water tests with propeller (and duct) in axial or oblique flow.
- Behind hull condition with single, twin or triple

- screw installations.
- Azimuth thrusters.
- Z-drive installations.
- Underwater vehicles (submarines, ROV's etc.)
- Hydrofoils with or without remotely controlled flaps.

Measurements and observations

- Cavitation observation (sketches, photos and high speed video)
- Cavitation erosion detection by paint technique
- Measurements of propeller induced pressure fluctuations in the aftbody
- Measurements of propeller induced noise
- Propeller blade loading measurements
- Six-component propeller loading measurements
- Six-component force measurements of test object

MARINTEK's standard procedure for propeller cavitation testing in behind condition, is to use aftbody model and simulation of estimated full scale wake distribution, based on the measured wake distribution in the towing tank.



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