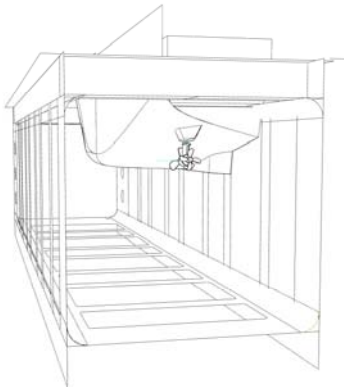
The new test section of the cavitation tunnel

The cavitation tunnel new test section is part of a number of development and upgrading projects for the laboratories operated at SINTEF Ocean as part of NFR's INFRASTRUKTUR programme.

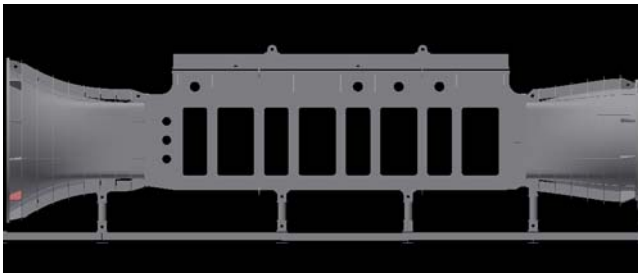
The current cavitation tunnel was built in 1967 and featured a circular test section and a long shaft that drove the propeller model.

Ever since its construction the cavitation tunnel has been an important tool for the industry, the university and for research. However, as the year passed, the need for modernizing the facility grew. In 2015 the Research Council of Norway (NFR) granted the resources needed to upgrade the test section of the facility under the National Financing Initiative for Research Infrastructure (INFRASTRUKTUR).

With the test section upgrade, the cavitation tunnel will have a rectangular cross section with large windows and the propeller will be driven from inside the ship models.



The large windows will allow alternative measurement techniques such Particle Image Velocimetry (PIV), Laser Doppler Velocimetry (LDV) and Digital Image Correlation (DIC), thus expanding the range of services that the cavitation tunnel has traditionally offered such as cavitation observations, pressure pulses and noise measurements.



The new model configuration with the motors installed inside models will enable running several propulsors at the same time and hence allowing complicated propulsive setups to be tested.

The new cavitation tunnel design will enable to host models up to 6 meters in length and 1.1 m in width. The maximum water speed will be 12 m/s and the minimum operating pressure 15 kPa. Models can be installed in either the centre of the test section for single screw configurations, or against the side of tunnel for twin-screw layouts.

MAIN FEATURES OF THE NEW TEST SECTION

- Size of the test section WxH : 1.3 x 1.2 m
- Length : 6m
- Maximum water speed : 12 m/s
- Minimum working pressure : 15 kPa , absolute
- Maximum working pressure : 250 kPa, absolute
- Size of the top hatch LxW : 5.5 x 1.1 m
- Contraction ratio : 4.53
- Typical propeller size: 200mm ~ 400 mm
- Propeller dynamometer with 2 or 6 components force measurement.
- Model size up to 6m (L) and 1.1 m (B)

FUTURE RESEARCH ACTIVITIES

As soon as the new test section will be commissioned, it will be used for carrying out research in the field of fluid structure interaction and propeller noise. In fact, SINTEF Ocean is project manager of two research projects, FleksProp and ProNoVi, that are concerned with the above mentioned topics.

FleksProp will combine advanced experimental techniques such as Digital Image Correlation and numerical simulations (Computational Fluid Dynamic and Finite Element Method) to study the hydroelastic behaviour of marine propellers and thrusters to improve their performances and their reliability. The cavitation tunnel will be used to generate an unique set of data to be used in simulation and design software. FleksProp is a collaboration between SINTEF Ocean, Rolls Royce Marine and NTNU with the financial support of the Research Council of Norway under the programme MAROFF and of Rolls Royce Marine. The project started in 2017 and will be finished in 2021.

ProNoVi will investigate the noise emission of propellers that operate behind a ship hull. Among the many goals the project has, deepening the theoretical understanding behind noise generation by marine propellers stands out as the most challenging and interesting. In order to achieve this ambitious goal the project aims at improving experimental techniques to measure noise in model scale as well as adopting advanced computational techniques to simulate multiscale flow turbulence, induced vorticity, cavitation dynamics and sound propagation. ProNoVi is an R&D project within ERA-NET Cofund MarTERA program of Horizon 2020 of European Commission with an international consortium constituted by the following consortium: SINTEF Ocean (Co-ordinators), Hamburg University of Technology (Germany), CNR INM (Italy), Helseth AS (Norway), SCHOTTEL GmbH (Germany), Fr. Lürssen Werft GmbH & Co. KG (Germany). The project started in 2018 and will be finished in 2021.

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