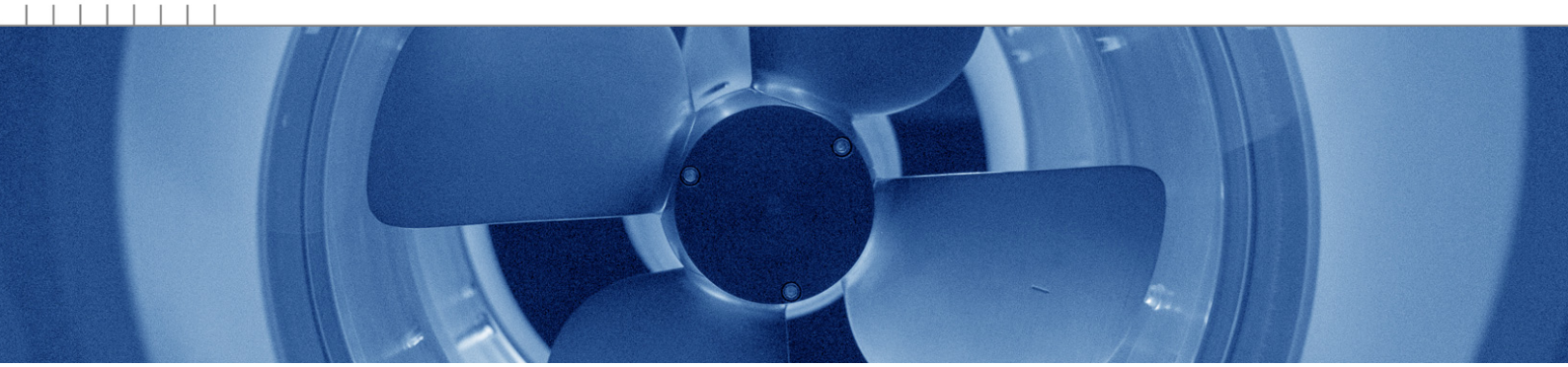


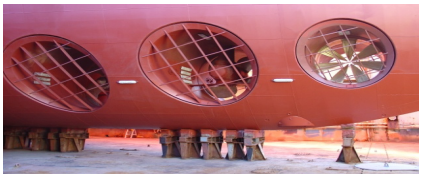
Low Noise Tunnel Thrusters

The Wageningen TT-series JIP

When making propeller designs for tunnel thrusters nowadays noise and vibrations issues have to be considered. This leads to a need for knowledge about how contemporary, optimised propellers would behave in a tunnel configuration. Moreover, propellers driven from the rim of a tunnel instead of through gears inside housing are being introduced in the market, for which similar knowledge is needed.

Main scope

- Design of Wageningen TT-propeller series (CPP, FPP: gear and rim driven)
- Side force tests for the complete propeller series at zero speed
  - Variation of Blade Area Ratio (BAR), blade number (4 to 7 for the FPP's) and design pitch
- Cavitation, noise and pressure fluctuations tests in Depressurised Wave Basin at zero speed
  - Variation of blade number, BAR, hull inclination, tunnel length, grid bar configurations, rounding of tunnel openings, power level
- Assessment of the effect of (low) ship speed on total side force on the ship by means of CFD (RANS)



Combination of mechanical and RIM driven tunnel thrusters. Photo: courtesy Brunvoll AS

There is limited systematic data on tunnel thrusters. Even today the only comprehensive data set is the one made by Taniguchi et al (1966).
This set comprises on the one hand a limited variation of propeller designs, but on the other hand an extensive variation of tunnel dimensions and tunnel shapes, effects of near-by walls, grid bars etc. Although these data still offer valuable information they do not fully address the issues mentioned above, and do not include rim-driven propellers.

In order to address the mentioned issues and to provide the industry with up-to-date knowledge and design guidance on tunnel thrusters MARIN decided to develop an initiative for a Joint Industry Project (JIP) on tunnel thrusters.

Main objective

Development of a method to select and design as well as to predict the performance of tunnel thruster propellers (gear or rim driven), considering:

- Tunnel shape, dimensions, position
- Required side force
- Noise and vibration aspects

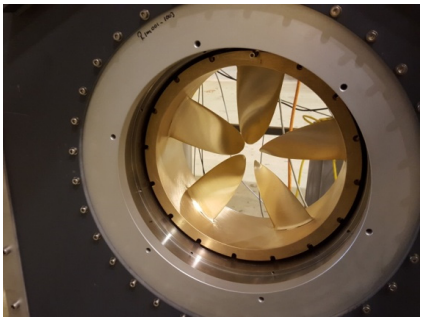
This method will be delivered in the form of easy-to-apply software that is similar to what has been developed for the Wageningen CD-series JIP. It will be a practical tool that can be used by technical staff of shipyards, ship owners, ship designers and equipment manufacturers. It allows making quick assessments of consequences of design choices about tunnel thruster configurations on aspects of side force, noise and vibration levels.

Envisaged timeline

The project will run for 3 years.

- Start of the project: December 2015
- Completion: June 2018

Test set up for mechanical drive tunnel thruster



RIM drive propeller model being prepared for testing

Find out more and get involved

The Wageningen TT-series JIP started in December 2015 and has 20 participants, MARIN included (status of July 2016). In view of the issues that are addressed the JIP is interesting for equipment designers and manufacturers, ship designers and ship yards, ship owners and operators, classification societies and possibly others, like e.g. universities. Additional participants can join the project at any time!

For more information contact MARIN:
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E ships@marin.nl

Organisation

The organisation is similar to the one of the Wageningen CD-series JIP. MARIN acts as JIP manager, taking care of the necessary participation agreements with all JIP members and issuing sub contracts (if applicable). The JIP is being managed in a democratic manner. The JIP chairman is elected by the members. Regular meetings, typically twice a year during the MARIN Vessel Operators Forum, will be arranged. All members have full and exclusive access to the project reports, software and other relevant information through the confidential project website.

Status summer 2016

In February 2016 a brainstorm session was held with propeller designers from several project participants. Ideas were shared about how to design low-noise propellers for tunnel thrusters without compromising the side force performance. This resulted in a number of ideas, which were translated in real designs to be model tested in October 2016. After these tests the participants will decide which idea was the best. The selected design will be used as the basis for the systematic series of propellers. These will be tested in 2017. In parallel MARIN designed and built the test set-ups for the gear driven and for the RIM driven tunnel thrusters. System tests were conducted during the summer of 2016 as preparation for the testing campaign of October 2016.

The membership as per July 2016 is:

1 Brunvoll (Norway)
2 Caterpillar (Sweden)
3 China Marine Development and Research Centre (CMDRC, China)
4 China Ship Scientific Research Centre (CSSRC, China)
5 Damen Shipyards (The Netherlands)
6 Fincantieri/CETENA (Italy)
7 IHC Shipyards (The Netherlands)
8 Jastram (Germany)
9 Kamome (Japan)
10 Kawasaki (Japan)
11 Nakashima (Japan)
12 Navantia (Spain)
13 Oceanco Shipyard (The Netherlands)
14 Rolls Royce Marine (Norway)
15 Scana Volda (Norway)
16 Schottel (Germany)
17 Shanghai Marine Equipment Research Institute (SMERI, China)
18 Voith (Germany)
19 Wärtsilä (Netherlands)