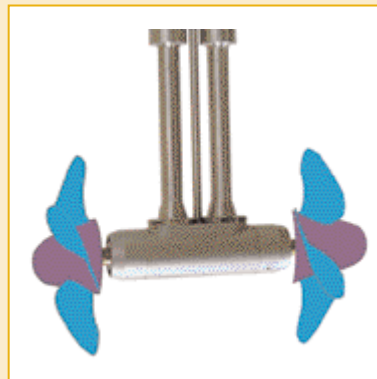


Model pods - a sophisticated approach

Nowadays pods are very common on cruise ships as their operators face spiralling demands regarding vibration and noise in combination with heavy usage of electric energy. MARIN has over five years experience in model testing podded propelled vessels, on more than 35 commercial and research projects. From the first, it has made use of pod units measuring, amongst other quantities, thrust and torque inside of the propeller hub. This report by Cornel Thill.



Right angle drive units mounted inside of a virtual housing.

The pod concept does away with some conventional ship propulsion accessories, such as propeller driveshaft, rudder, reduction gear and so forth. Instead, one or more pods are installed, housing an electric engine and capable of turning 360 degrees. Propellers are mounted in a pulling and / or pushing position, depending on the mission profile of the vessel, the target speed, the demand for passenger comfort, and the specific requirements of pod manufactu-

ers. A wide variety of propulsion arrangements are possible, ranging from (multiple) pod only to combinations with conventional shafts which can even create a contra rotating set-up.

Models

For model tests programs with pod units, use is made of advanced measuring devices engineered and developed for model tests with conventional thrusters. Often the geometry of an arbitrary pod unit is modelled for a specific project. As an alternative, with approval of the manufacturer, available units in MARIN's vast stock can be used. The shape of the gondola and the streamlined strut are built around these units. Comparable to MARIN's technique applied to conventional shafts, thrust and torque are being measured inside of the propeller hub, without frictional losses of the sealing, bearing and gears. The total unit force is being measured by means of a six component balance.

Model tests

The performance of new units is typically investigated by open water tests. The interaction between pod and hull is investigated by means of flow line tests with tufts. Self-propulsion tests with the units mounted to a scaled model are conducted in order to:

- Strive for optimum direction of rotation, tilt angle and rudder angle. For such tests the units can seesaw and turn to some extent.
- Measure the propulsion performance with stock and design propellers, with particular attention paid to cavitation behaviour and pressure pulses.
- In rarer cases, determine the optimum position of the pod in length and breadth direction.
- Predict the vessel's performance on trials and in service. Scale effects due to the resistance of the pod housing are considered and corrected, as we are able to measure thrust inside of the hub(s) compared to the total unit force.