

Hydrodynamic advice ensures dream yachts become reality



For many years MARIN has been helping keen yacht owners realise their dream yachts, knowing that decisions can often be driven by emotions rather than purely about value for money concerns.

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Aesthetical aspects and 'feel good' factors can be just as important. Designers and shipyards have to meet the challenge by realising the owner's dream but at the same time, work within technical and financial constraints. Aesthetics of the superstructure and the profile of the ship must go hand-in-hand with technical requirements related to the expected operational profile.

A yacht owner must be confident that his vessel can sail freely and safely in any part of the world and that it will also be comfortable and be able to realise the required range and speed.

Here, MARIN's hydrodynamic assistance related to the powering, manoeuvring and seakeeping aspects during the design process of motor yachts has played a vital role in ensuring that these yachts will not be a disappointment.



General advice and specific research

Usually, MARIN starts with a speed-power prediction and then gives general advice on preliminary hull lines and appendages with respect to powering, manoeuvring and seakeeping. This is followed by more specific research covering all these aspects.

During calm water tests the propulsive performance is determined and optimised. Furthermore, the wave profile is observed to check the positioning of anchor pockets and possible spray over the bow. Moreover, positioning of the exhaust pipes is examined to avoid possible problems with too much engine back pressure and the positions of fenders are checked to avoid additional resistance and spray. There has been increasing interest in investigating propeller-induced noise and vibration. For this important comfort aspect in motor yacht design MARIN's modernised Depressurised Towing Tank is the ideal facility.

Manoeuvring and seakeeping performances are highly important. Clearly, course keeping in calm water and in stern-quartering waves, roll stabilisation, avoiding collisions and harbour-approaching behaviour need to be excellent but also other manoeuvres such as turning on the spot and mooring the yacht into a berth need to be perfected. Typical manoeuvring qualities can be demonstrated by course keeping, turning, yaw checking, initial turning, stopping and crabbing ability. These qualities can be determined by calculation, by free sailing model or captive model tests.

'Feel good' factors

Comfort qualities are more the 'feel good' factors. To identify performance here, MARIN examines factors such as heel angles during steering and the

acceleration caused by rudders if the vessel is course unstable and the autopilot is constantly correcting. Noise and vibrations caused by cavitating propellers straight ahead and during a turn are also qualified as 'feel good' factors. These can only be qualified by model tests.

Finally, specific seakeeping qualities such as comfort at anchor and in transit, as well as structural integrity of the vessel are also calculated and tested. Dedicated work on appendages will drastically improve comfort onboard. Rudders, fin stabilisers and their mutual control law, as well as anti-roll tanks or bilge keels, have a prominent role in contributing to comfort levels. A well designed general arrangement will also increase the comfort of the owner's living spaces by placing them at the right location.

In terms of safety, a careful evaluation of the limiting operational conditions in terms of sea states, headings and speed, will allow the master to sail to the maximum of the yacht's ability, while avoiding damage to the vessel or to goods onboard.

Model tests

Powering performance, risk of cavitation erosion, noise and vibration, and manoeuvring or seakeeping performances can only be accurately qualified by model tests. New facilities such as the Seakeeping and Manoeuvring Basin or the upgraded Depressurised Towing Tank have proved that they can help fulfil these goals. Several test programs conducted in close co-operation with the naval architect, the shipyard and the future master of the vessel have all played a vital role in ensuring that the dream of the yacht owner becomes reality. **MARIN**