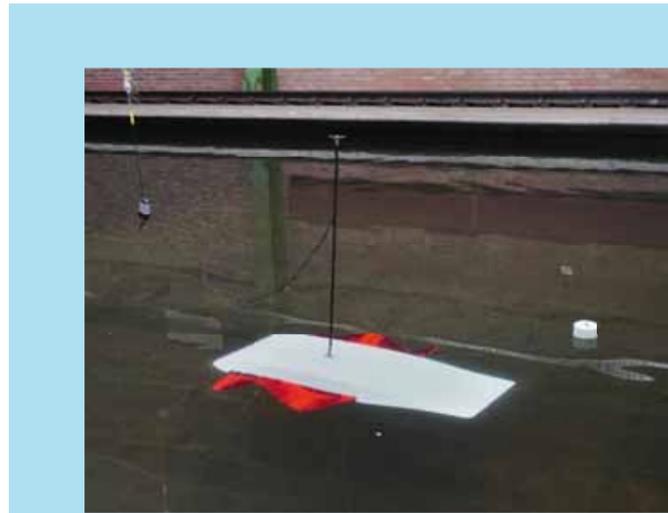


Free basin time for SME concept testing

To stimulate Dutch maritime innovation, MARIN has invited Small & Medium Enterprises to test their new ideas and concepts for free in 2016 and previous years, and it has offered the same opportunity again this year. Here we highlight some of the concepts that were successfully tested in 2016. [jaap de Wilde, j.dewilde@marin.nl](mailto:jaap.de.Wilde@marin.nl)



Galatea fin propulsion



Sunfloat® floating PV panels



The Ocean Cleanup

Galatea fin propulsion Galatea is a collaborative research project between Delft University of Technology and Wageningen University. The project focuses on undulatory fin propulsion, a technique found in nature used by species that excel in manoeuvrability. For example seahorses, cuttlefish, rays and knife fish all have a similar propulsion system. Research into an integral propulsive solution that comprises an undulatory fin as its main propeller can result in a highly manoeuvrable underwater vehicle, which has a minimal impact on the environment. The objectives of the Galatea project are to develop, design, build and test a bio-inspired Autonomous Underwater Vehicle (AUV). Initially, the AUV will operate as a research platform to investigate the unique features of undulatory fin propulsion.

A fully operational model with undulating fin propulsion was tested by two PhD students from both universities. The tests with the model in waves were invaluable, because the orbital wave motions act as a disturbance, which makes the manoeuvrability more difficult and realistic. www.galatea-project.nl

Sunfloat® floating PV panels The Sunfloat innovation project aims to develop floating photovoltaic (PV) energy

harvesting systems for large open water areas. The Sunfloat system improves energy efficiency by intensifying the reflection of the sunrays on the free water surface, by increased passive cooling and by making the rotation towards the sun easier. The Sunfloat innovation is attractive as it offers higher efficiency and lower installation costs.

Two full-scale prototypes of the Sunfloat floating devices – including vertical solar panels – were tested in various wave conditions. The tests help provide better insight into the motion behaviour and the mooring line loads. They were also needed for optimisation of the system for deeper water and less sheltered, open water locations. www.sunfloat.com

The Ocean Cleanup The Ocean Cleanup develops systems to clean the world's oceans from plastic using a passive system involving extremely long, floating barriers that allow the garbage to be collected and concentrated using only natural ocean currents. In 2015, the concept was already tested at MARIN. Investigations studied the motion response of the barrier to the conditions encountered in the North Pacific at 1:20 scale. While such a scale is sufficient to characterise the motion

response of the barrier, it is not suitable to investigate the capture efficiency of the barrier.

Therefore, new tests comprised a 2D section of a rigid, as well as a flexible structure, at a scale of 1:5. The picture shows the model barrier with drifting plastic objects of various sizes. The complex interaction between the flow and the plastic objects was investigated for a broad range of wave and current conditions. Results will later be used for the optimisation of the barrier and for further validation of CFD models. www.theoceancleanup.com

Seaqualizer, spring balanced offshore access bridge The Seaqualizer has been developed to improve offshore heave compensation for access bridges. The Seaqualizer technology converts the non-linear force of a gas (or hydro-pneumatic) spring into an easily adjustable linear force. This is done by several mechanical measures. A detailed scale model of a ship with the Seaqualizer system and an offshore access bridge was tested. The project confirmed that balanced heave compensation enables a range of potential benefits compared to other solutions, such as increased safety, energy savings (>50% compared to existing solutions), ease of engagement and



Seaqualizer, spring balanced offshore access bridge



Hull Vane® energy saving device

reduced gas volume. These benefits will lead to a range of new solutions for offshore motion compensation and will also lead to improvements and cost savings in (engaging) existing heave compensation systems.

The model was equipped with several active force feedback control systems to overcome this problem. MARIN further assisted with the development of a numerical model of the ship in waves and the active heave compensation. With the tuned and validated numerical model,

additional environmental conditions, not included in the basin tests, can be simulated numerically. www.nhlo.nl/seaqualizer

Hull Vane® energy saving device The Hull Vane is a patented, fixed foil located below the stern of a yacht or fast ship, for energy saving and improved seakeeping. It influences the stern's wave pattern and creates hydrodynamic lift, which is partially oriented forwards and results in a reduction of the ship's resistance. The performance of the Hull

Vane depends on the ship's length, speed and hull shape in the aft section. The reduction in resistance ranges from 5% to 15% for suitable ships. In specific cases, savings up to 20% are possible.

The Hull Vane concept was tested at MARIN by a team of experts from the founder company Van Oossanen. The tests avoided getting too involved in details at an early stage. The optimised settings of the foil were used for the further development of CFD studies. www.hullvane.nl