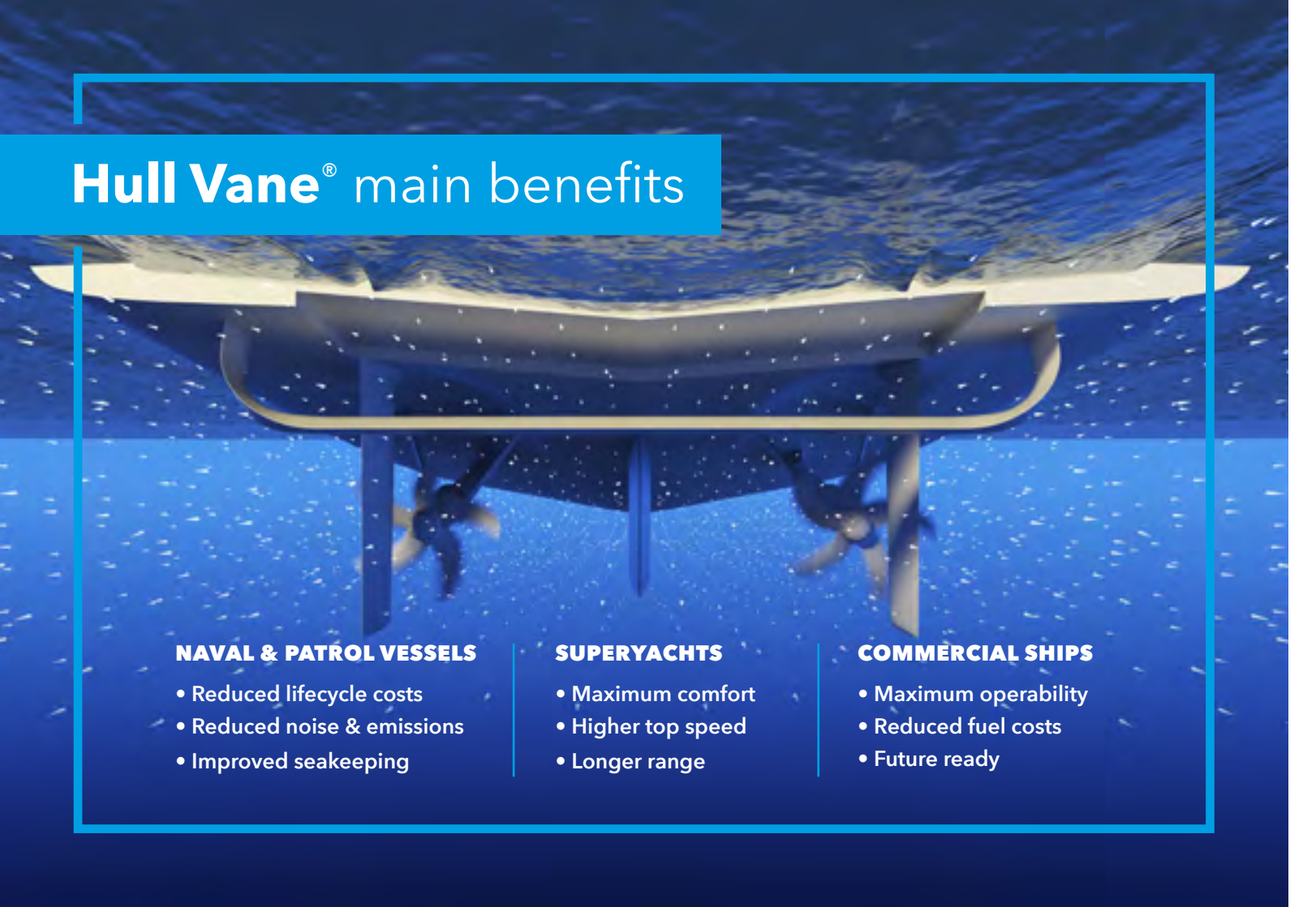

hullvane
WE MASTER HYDRODYNAMICS

Hull Vane® main benefits



NAVAL & PATROL VESSELS

- Reduced lifecycle costs
- Reduced noise & emissions
- Improved seakeeping

SUPERYACHTS

- Maximum comfort
- Higher top speed
- Longer range

COMMERCIAL SHIPS

- Maximum operability
- Reduced fuel costs
- Future ready

The Hull Vane® is a fixed hydrodynamic wing at the stern of a ship, which converts energy of the stern flow into forward thrust. This reduces the ship's resistance and dampens the pitching, heaving and rolling motions when sailing in waves. For certain vessels, the fuel consumption can be reduced by between 5% and 26% depending on the ship's length, speed and hull design.

WE MASTER HYDRODYNAMICS

The Hull Vane® is custom-designed and optimised specifically for each ship using Computational Fluid Dynamics (CFD) software. In addition to the calculated resistance reduction, this optimisation gives a clear view of the effect on the stern wave and flow lines. Based on the results the return of investment can be calculated in case of a retrofit. In case of a newbuild, the naval architect can reduce the size of the main engines, exhaust systems and fuel tanks for the required rang and top speed.

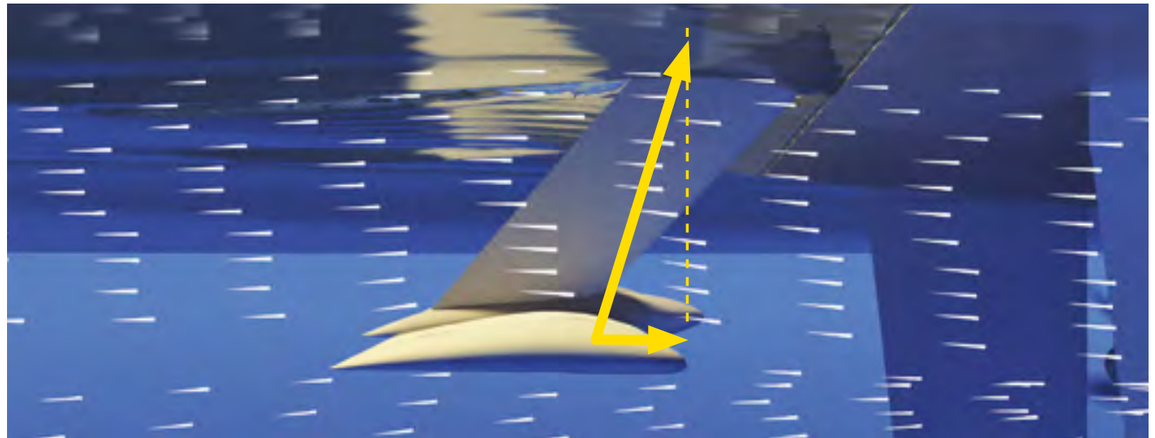
PATENTED

Hull Vane® is a patented hydrowing custom built for ships and superyachts. The Hull Vane® was invented by Dr Pieter van Oossanen and is protected by patents in all major shipbuilding countries. The Hull Vane® has been further developed and optimised in the last few years by a team of hydrodynamicists and CFD specialists.

how

FORWARD THRUST

The flow of water under a vessel's stern is often not horizontal, but angled upwards. The Hull Vane® has a horizontal wing profile, which generates lift perpendicular to this flow. The horizontal component of this lift provides a forward thrust force transmitted through the Hull Vane's struts. The wing's hydrodynamic profile is such that the thrust it generates is greater than the drag it creates. Hence, the net result is reduced resistance for the vessel as a whole.

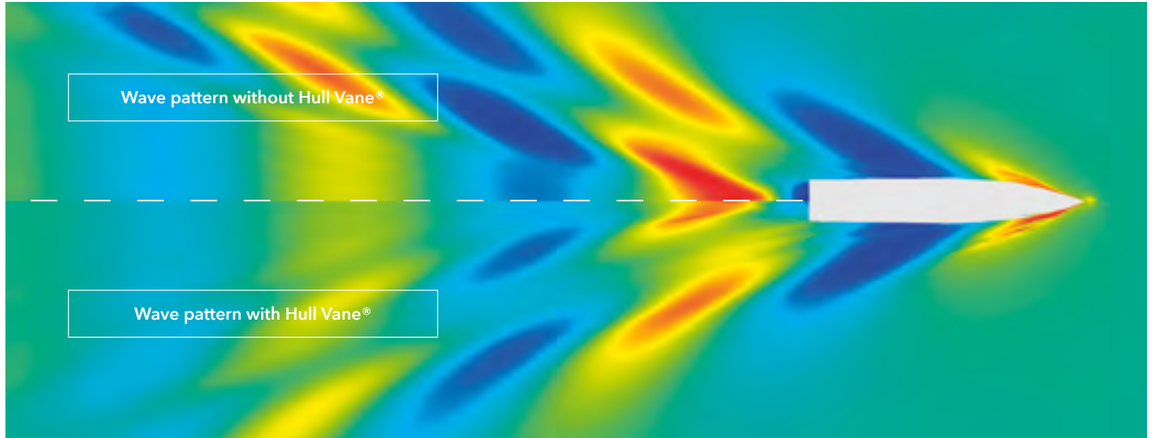


WAVE REDUCTION

The accelerated flow of water over the Hull Vane's top surface creates a low pressure region that interacts with the vessel's wake, suppressing its stern wave – in much the same way as a bulbous bow suppresses a vessel's bow wave. A vessel's wake or wave pattern correlates with the energy used for propulsion purposes. Suppressing the stern wave therefore reduces fuel consumption. In addition the noise of the wake is reduced, there is less disturbance to other ships and (naval) ships become less visible.

Wave profile at 15 knots without Hull Vane®

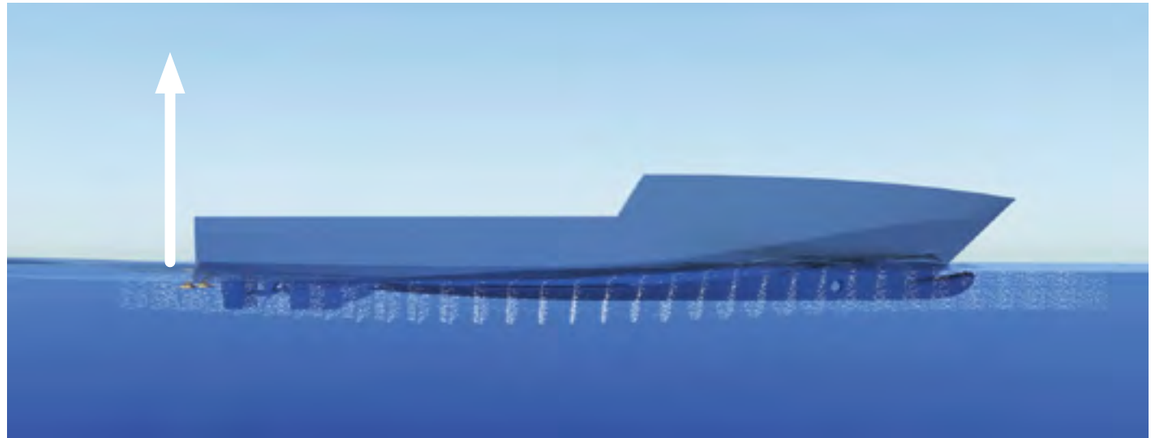
Wave profile at 15 knots with Hull Vane®



how

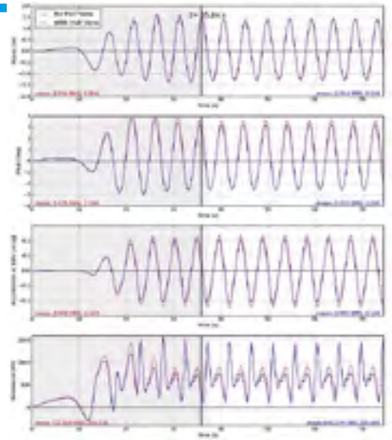
TRIM CORRECTION

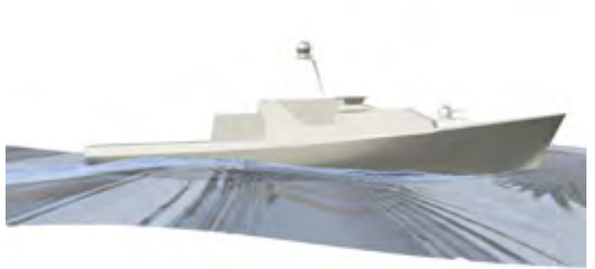
The Hull Vane® reduces the running trim, keeping the vessel at even keel throughout the entire speed range. Taking the Hull Vane® into account in the design from the beginning, allows naval architects to design a vessel with minimal trim variations. In shallow water the vertical component of the lift significantly reduces the squatting effect, allowing for a higher top speed.



PITCH STABILISATION

When sailing in waves, the Hull Vane® dampens the pitching motions. This reduces the added resistance from waves and improves the comfort onboard and the safety of operations such as helicopter landings or the launch and recovery of daughter crafts. Moreover, when the ship is pitching, the Hull Vane® generates additional forward thrust due to the “pumping effect”.





5-26% LESS FUEL

SUPERYACHTS

COMMERCIAL SHIPS

NAVAL & PATROL VESSELS

effectiveness

The Hull Vane® is particularly effective when used on medium speed displacement vessels, or expressed in naval architecture terms at Froude numbers between 0.2 and 0.8.

Suitable candidates for a Hull Vane® include coastguard and naval vessels, passenger ships, ro-ro ships, expedition cruise ships, fast supply vessels and motor yachts.

For these types of vessels, energy savings of between 5% and 20% are typical and in some cases even 25% savings are attainable.

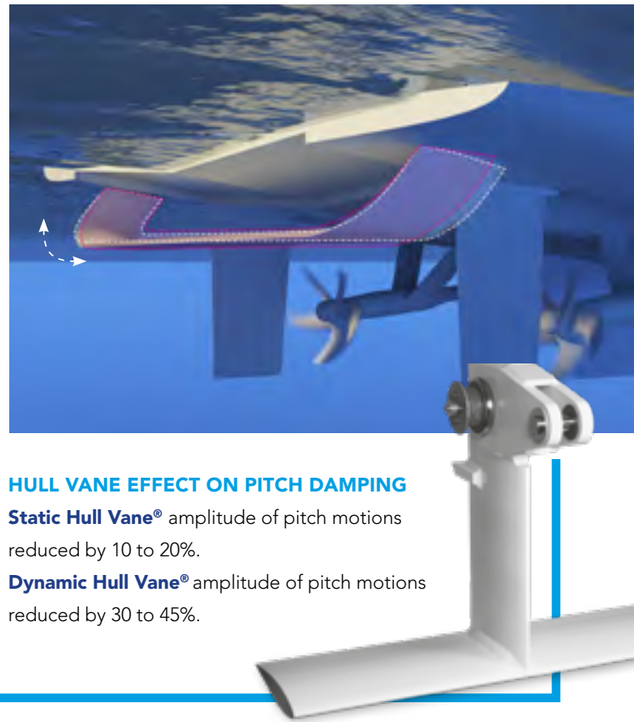
Froude numbers (Blue = check Hull Vane®)

length (m) \ speed (knots)	6	10	14	18	22	26	30	34
20	0,22	0,37	0,51	0,66	0,81	0,95	1,10	1,25
40	0,16	0,26	0,36	0,47	0,57	0,68	0,78	0,88
60	0,13	0,21	0,30	0,38	0,47	0,55	0,64	0,72
80	0,11	0,18	0,26	0,33	0,40	0,48	0,55	0,62
100	0,10	0,16	0,23	0,30	0,36	0,43	0,49	0,56
150	0,08	0,13	0,19	0,24	0,30	0,35	0,40	0,46
200	0,07	0,12	0,16	0,21	0,26	0,30	0,35	0,39
250	0,06	0,10	0,15	0,19	0,23	0,27	0,31	0,35
300	0,06	0,09	0,13	0,17	0,21	0,25	0,28	0,32

Sea trials before and after retrofitting a Hull Vane® on the 52m Offshore Patrol vessel Thémis demonstrated a reduction in fuel consumption of 18 to 27% at speeds from 12 knots to the maximum of 21 knots, and a top speed increase of 1.4 knots.

STATIC AND DYNAMIC HULL VANE®

For a lot of customers, mainly in the naval and superyacht domain, the seakeeping effect of the Hull Vane® is as important as the energy-saving aspect. In such cases, the pitch damping effect can be maximised by providing the Dynamic Hull Vane®. It has all the characteristics and benefits of the static Hull Vane®, but can become active at the flick of a switch. Hydraulic actuators are used to continuously modify the angle of attack, to provide even more pitch damping. The Dynamic Hull Vane® is the most effective active pitch damping device for displacement ships on the market. By reducing the vertical accelerations onboard, seasickness is reduced and operations on deck are improved, as well as the performance of all systems, which benefit from a more stable platform in waves. The Dynamic Hull Vane® is a collaboration of Hull Vane BV with renowned stabiliser manufacturer Naiad Dynamics.



HULL VANE EFFECT ON PITCH DAMPING

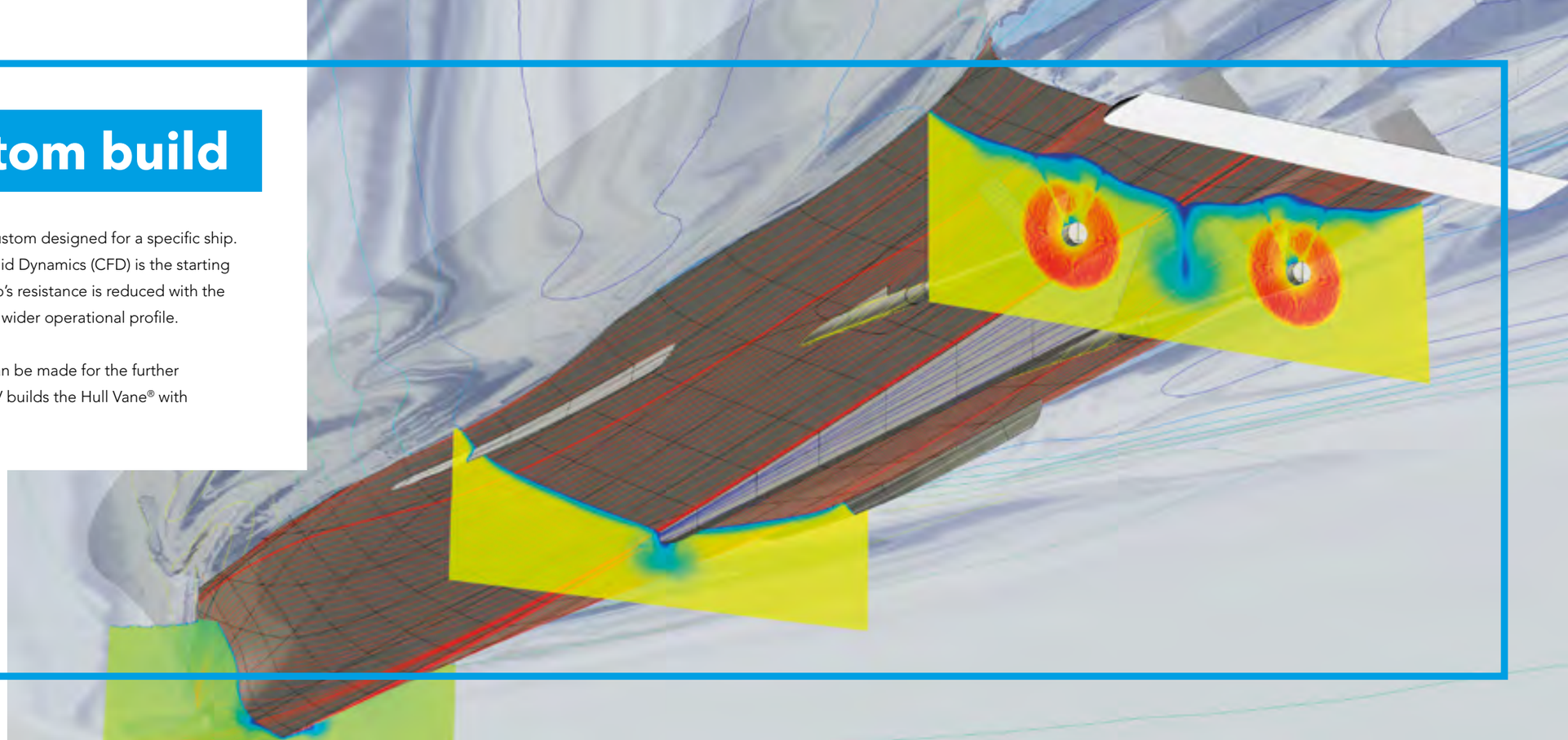
Static Hull Vane® amplitude of pitch motions reduced by 10 to 20%.

Dynamic Hull Vane® amplitude of pitch motions reduced by 30 to 45%.

custom design, custom build

Just like a bulbous bow, each Hull Vane® is different and custom designed for a specific ship. An optimisation of the Hull Vane® using Computational Fluid Dynamics (CFD) is the starting point. Such a Hull Vane® study indicates how much the ship's resistance is reduced with the addition of a Hull Vane® – either for a single speed or for a wider operational profile.

Based on the results of this study, a cost-benefit analysis can be made for the further engineering and construction of a Hull Vane®. Hull Vane BV builds the Hull Vane® with certified welders and a high degree of finish and accuracy.



full service

Hull Vane® is a full service proposition from custom design to delivery of the actual device for installation all around the world. As the Hull Vane® is produced off-site it can be delivered to the retrofit location before the ship comes in, ensuring a swift installation. Typically, the installation requires some strengthening in the transom. In the case of a newbuild this can be included in the ship design from the beginning.

WE MASTER HYDRODYNAMICS

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