hullvane®

WE MASTER HYDRODYNAMICS

Energy saving & Improved seakeeping

Hull Vane® Main Benefits

Superyachts
Maximum comfort
Higher top speed
Longer range

Commercial ships
Maximum operability
Cost savings
Future ready

Non-commercial ships
Reduced lifecycle costs
Reduced noise & emissions
Improved seakeeping

The Hull Vane® is a fixed hydrofoil positioned below or behind a ship's transom. It modifies the vessel's stern wave pattern and generates hydrodynamic lift with a forward component. This reduces the ship's resistance and dampens the pitching, heaving, rolling and yawing. For certain vessels, the fuel efficiency can be improved by between 5% and 26% depending on the vessel's length, speed and hull design.

We master hydrodynamics

The Hull Vane® is custom-designed specifically for each ship. We use computational fluid dynamics (CFD) software to optimise the performance of the Hull Vane®. 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 ship owner can calculate the return on investment, or – in the case of a newbuild – the naval architect can reduce the size of the main engines, exhaust systems and fuel tanks for the required range 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.



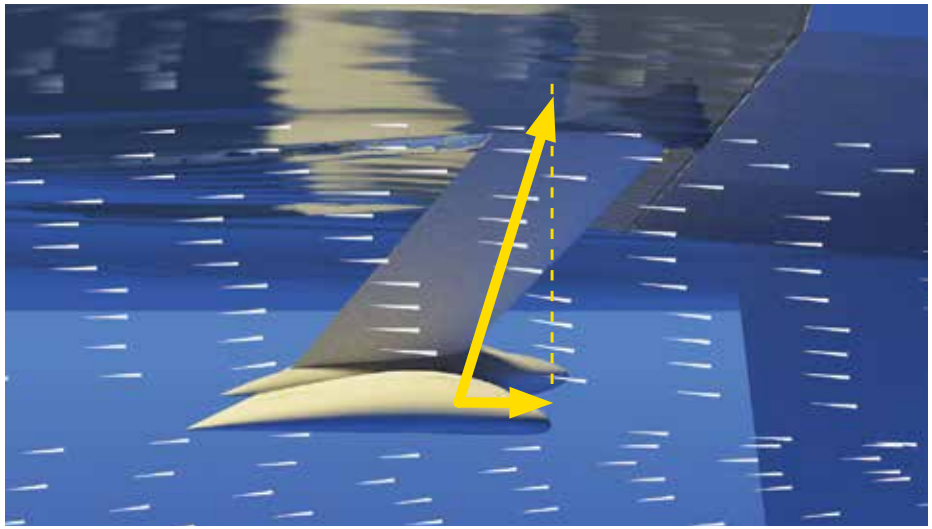
How

Wave profile at 15 knots without Hull Vane®

Wave profile at 15 knots with Hull Vane®

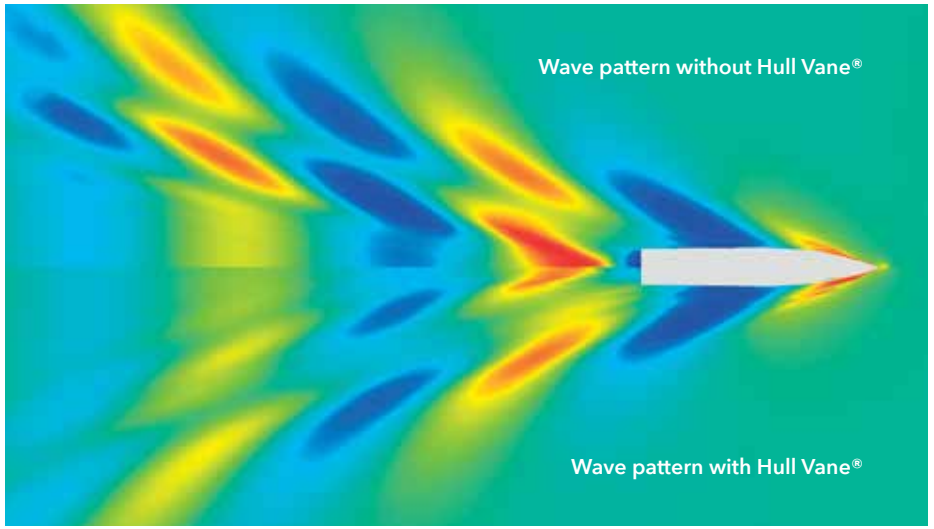
1 Forward Thrust

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.



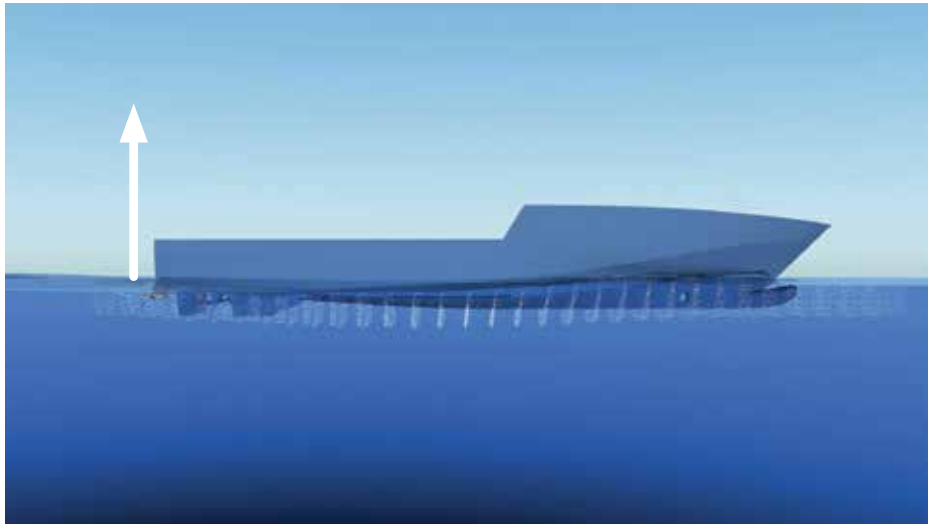
2 Wave Reduction

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.



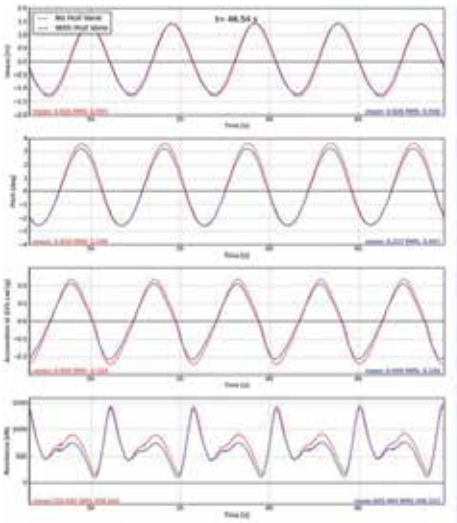
3 Trim Correction

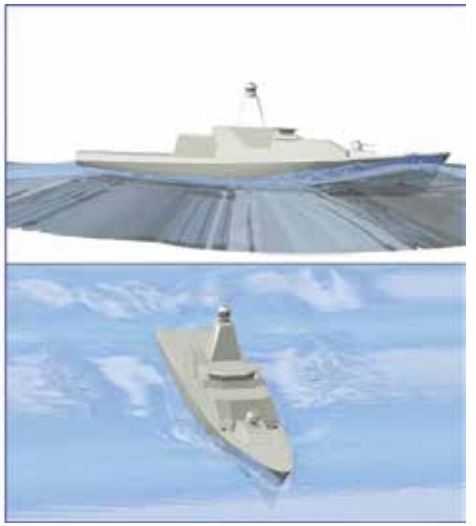
The Hull Vane® reduces the running trim, keeping the vessel at even keel throughout the entire speed range. Taking the Hull Vane® into account in the design from the beginning, allows naval architects to design a vessel with minimal trim variations. In shallow water the vertical component of the lift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



4 Pitch Stabilization

Moving a large horizontal plane vertically through water requires a lot of energy. The same applies to the Hull Vane®. 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 craft.



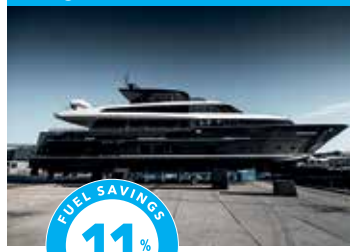


SUPERYACHTS

Alive

1 OF 7

Jangada



COMMERCIAL SHIPS

Karina

Linde-G

MS Valais

NON-COMMERCIAL SHIPS

Holland Class

RPA 8

PM41 Thémis

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. For a 50m vessel, this equates to a speed range between 8 and 30 knots. For 100m and 200m vessels, this equates to minimum speeds of 12 and 17 knots respectively.

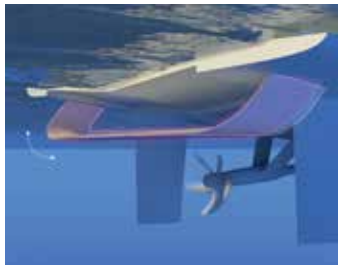
Froude numbers (Blue = check Hull Vane®)

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

Ideal 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 vessel, fuel savings of between 5% and 15% are commonplace and in some cases even 25% savings are attainable.

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 speed of 21 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, we can increase the pitch damping effect 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. Then hydraulic actuators vary the angle of attack to provide even more pitch damping. The Dynamic Hull Vane® is the only 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.

Hull Vane® effect on pitch damping

Static Hull Vane®

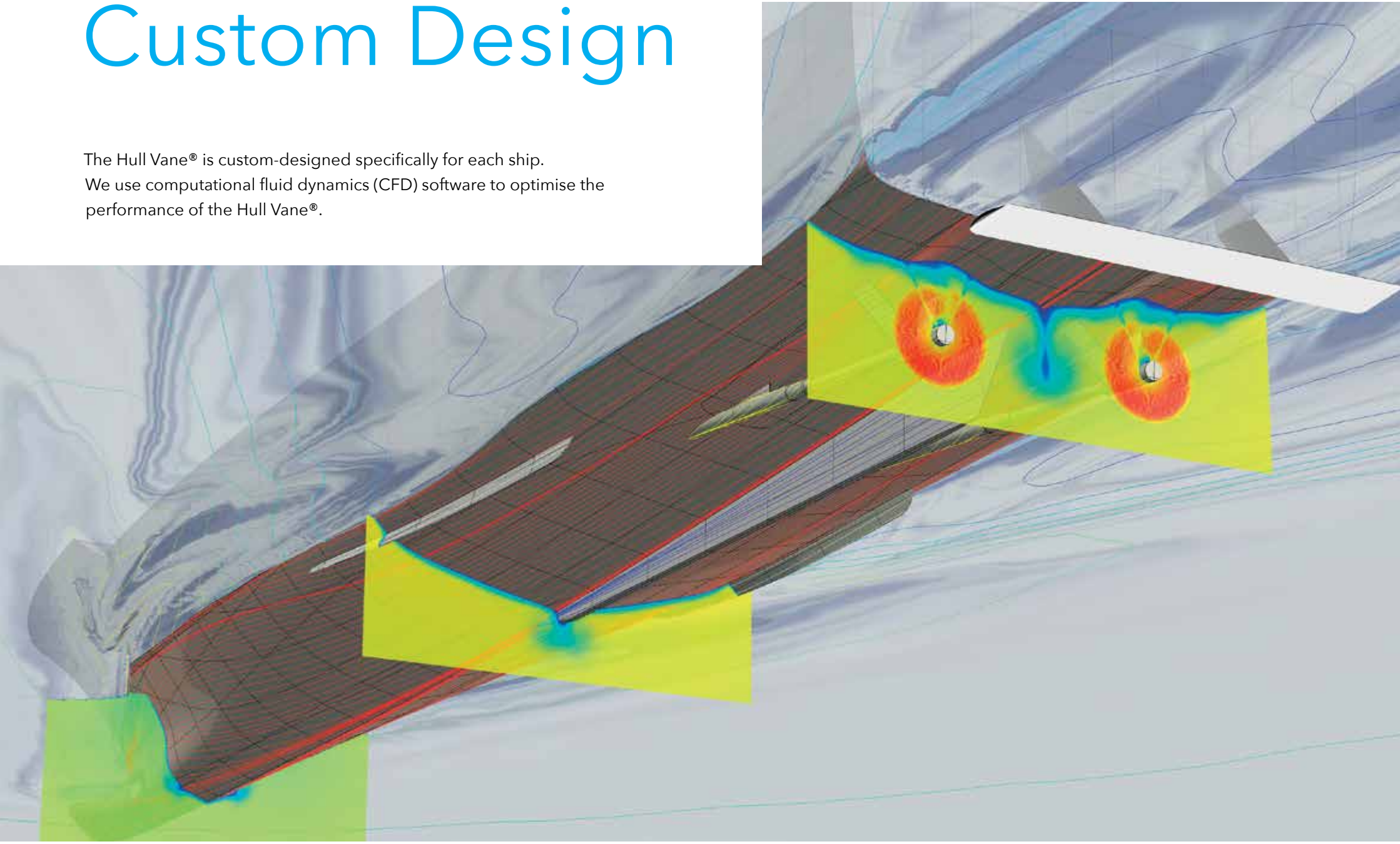
- amplitude of pitch motions reduced up to 21%

Dynamic Hull Vane®

- amplitude of pitch motions reduced by a further 14-31% (up to 46%)

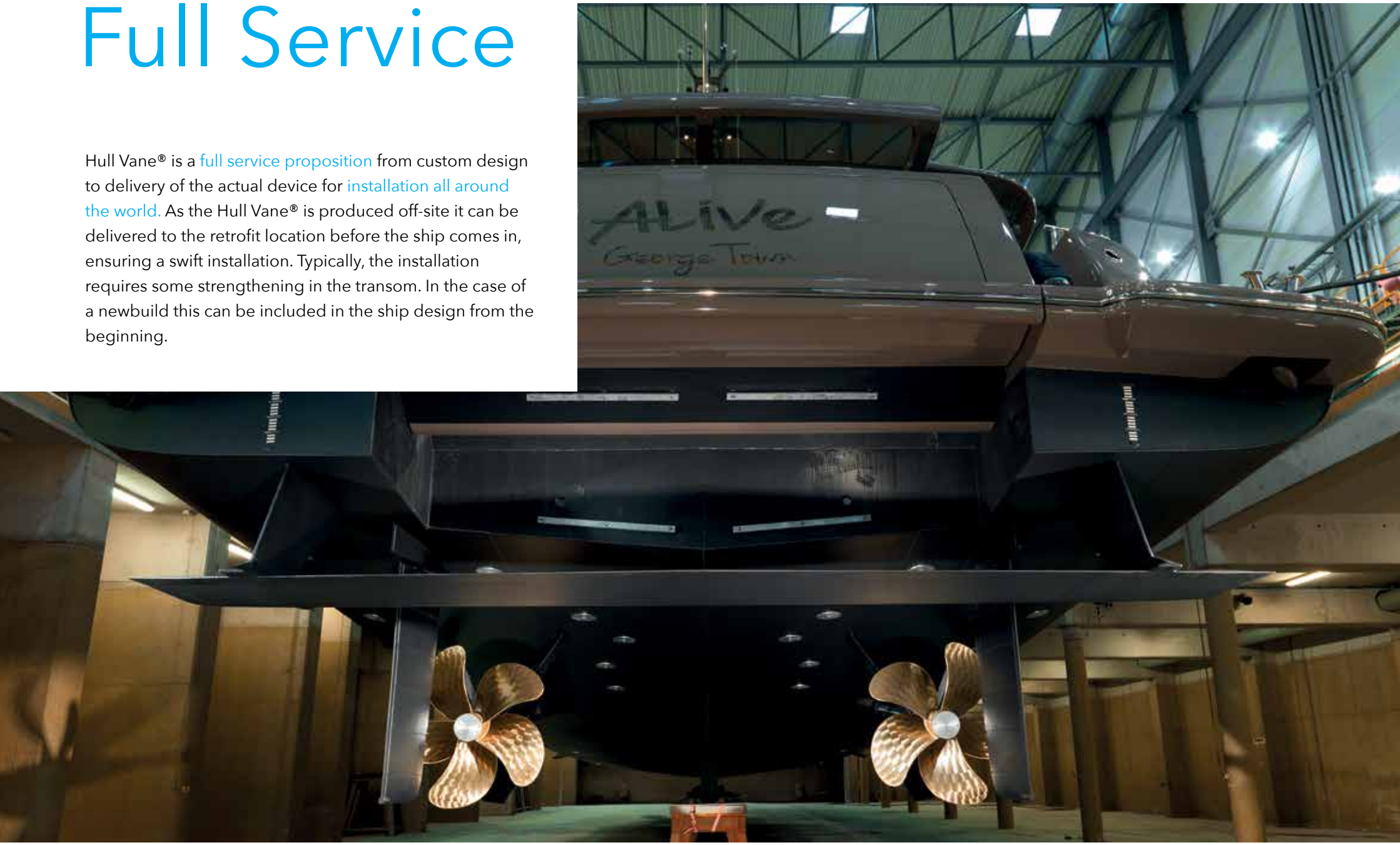
Custom Design

The Hull Vane® is custom-designed specifically for each ship.
We use computational fluid dynamics (CFD) software to optimise the performance of the Hull Vane®.



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.



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