The beauty of dynamic motion

INTRODUCING ABB DYNAFIN™

Movement perfected by evolution

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IRSO 2025 BERGEN

ABB

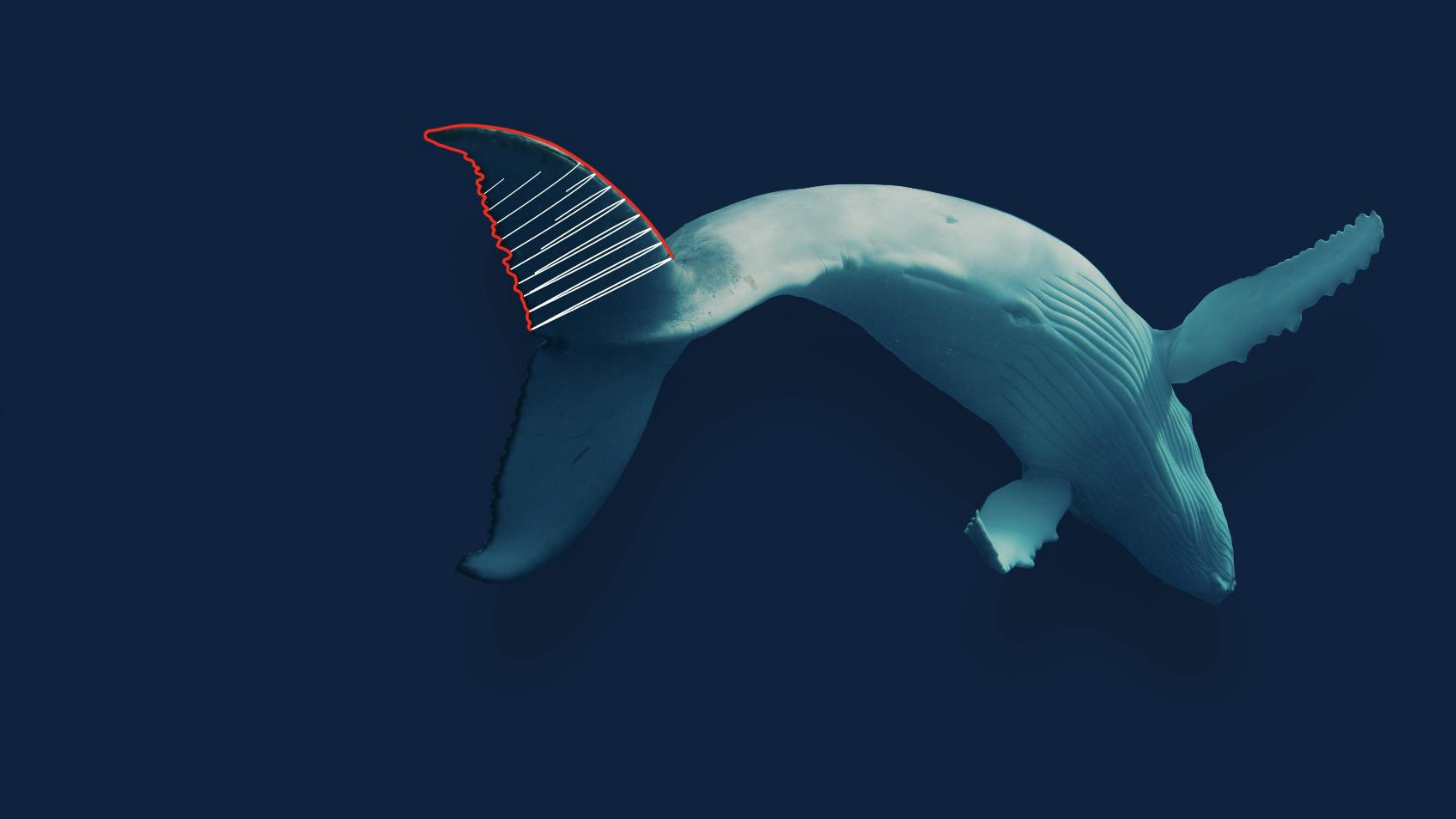


ABB across global markets

Employees
~105,000

Countries
>100

Revenues
~$29 bn

Europe
~$10.3 bn

Americas
~$9.6 bn

AMEA
~$9.6 bn

2022 figures

ABB is a technology leader in **electrification** and **automation**, enabling a more sustainable and resource-efficient future.

The company's solutions connect engineering know-how and software to optimize how things are **manufactured**, **moved**, **powered** and **operated**.

ABB


ABB Purpose
We enable a low-carbon society
We reach carbon neutrality in our operations by 2030 and partner with our customers and suppliers to reduce their emissions.
Integrity
We promote social progress
We take care of our people and promote social progress with our partners, suppliers and in communities.
Transparency
We preserve resources
We embed circularity by reducing waste, improving recycling and fostering reusability.

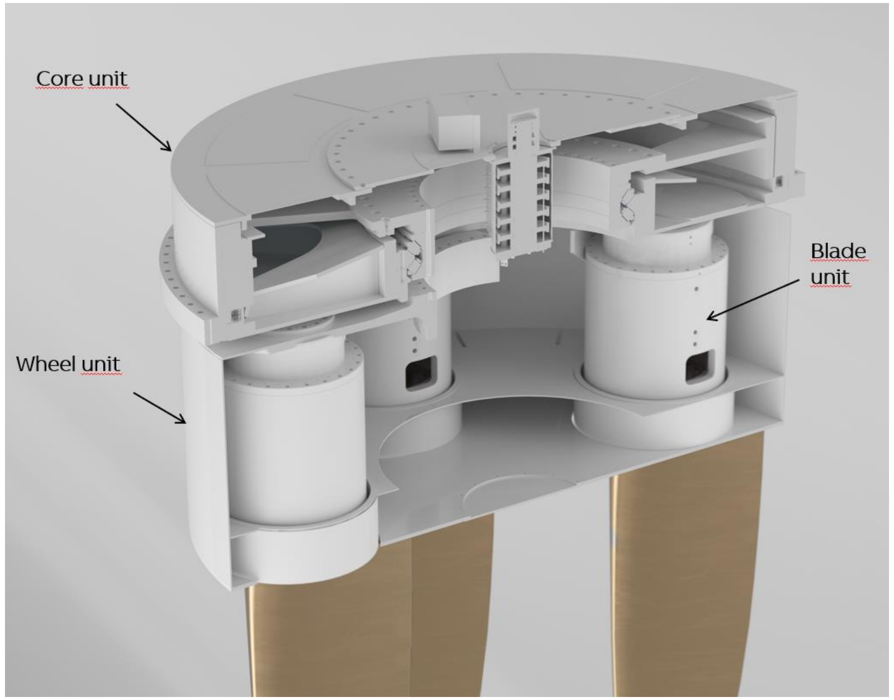
TECHNOLOGY UPDATE – ABB DYNAFIN™ BL MARINE PROPULSION

2025

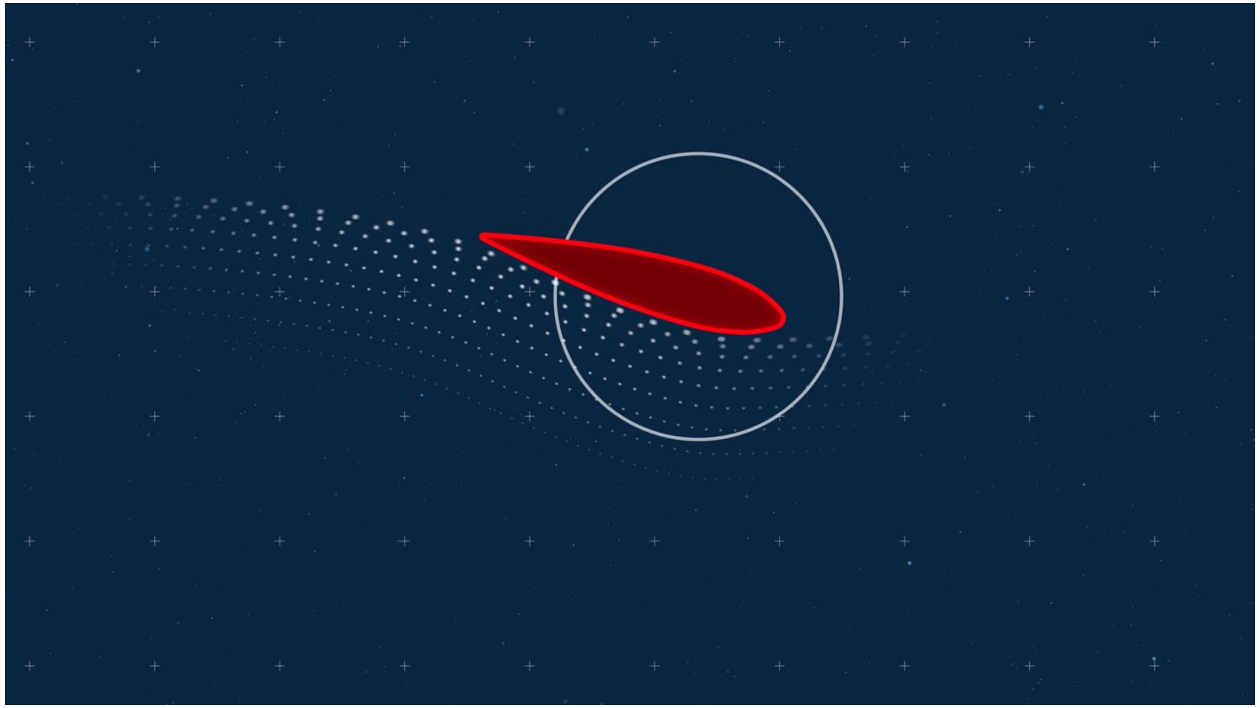
ENGINEERED
TO OUTRUN

Working principle

Main components



Blade motion



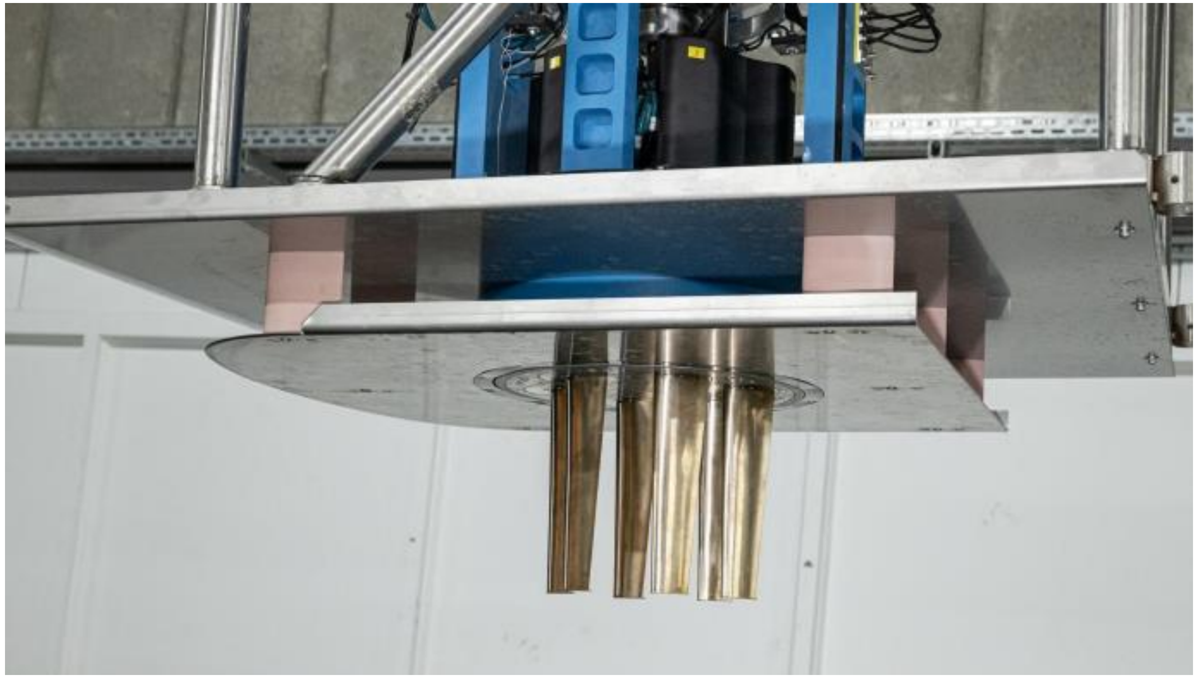
Performance -open water

Openwater model scale vs full scale extrapolated results

	wheel					fins
V_s	J	KT_m	KFy_m	KQ_m	ETA-o_m	Kq
[kn]	[-]	[-]	[-]	[-]	[-]	[-]
19.8	4.242	2.6467	1.0939	2.6391	0.677	-0.2263
18.0	3.857	3.0978	0.5209	2.8062	0.678	-0.1050
17.1	3.663	3.2854	0.1099	2.8607	0.670	-0.0615
16.2	3.471	3.4743	-0.1634	2.9287	0.655	-0.0657

			wheel			total
V_s	dKT	dKQ	KT_s	KQ_s	ETA-o_s	ETA_0_s
[kn]	[-]	[-]	[-]	[-]	[-]	[-]
19.8	0.3007	-0.1115	2.9474	2.5277	0.787	0.865
18.0	0.2739	-0.1039	3.3717	2.7023	0.766	0.797
17.1	0.2627	-0.1009	3.5481	2.7598	0.750	0.767
16.2	0.2894	-0.1124	3.7637	2.8163	0.738	0.756

Openwater test setup at MARIN



Performance-Self propulsion

Dynafin has been benchmarked against a conventional azimuth thruster installed on the same ship model during self-propulsion test

Key findings

Efficiency Gains: Significant improvements in open-water and hull efficiency.

Power Savings: Approximately 20% reduction in power consumption across the speed range, enhancing performance in both low speed and full-ahead conditions.

Vs	Power difference
[kn]	[%]
9	19.3 %
10	21.5 %
11	23.7 %
12	23.4 %
13	22.6 %
14	21.2 %
15	20.7 %
16	21.9 %
17	22.5 %
18	22.3 %
19	21.7 %

Underwater radiated noise

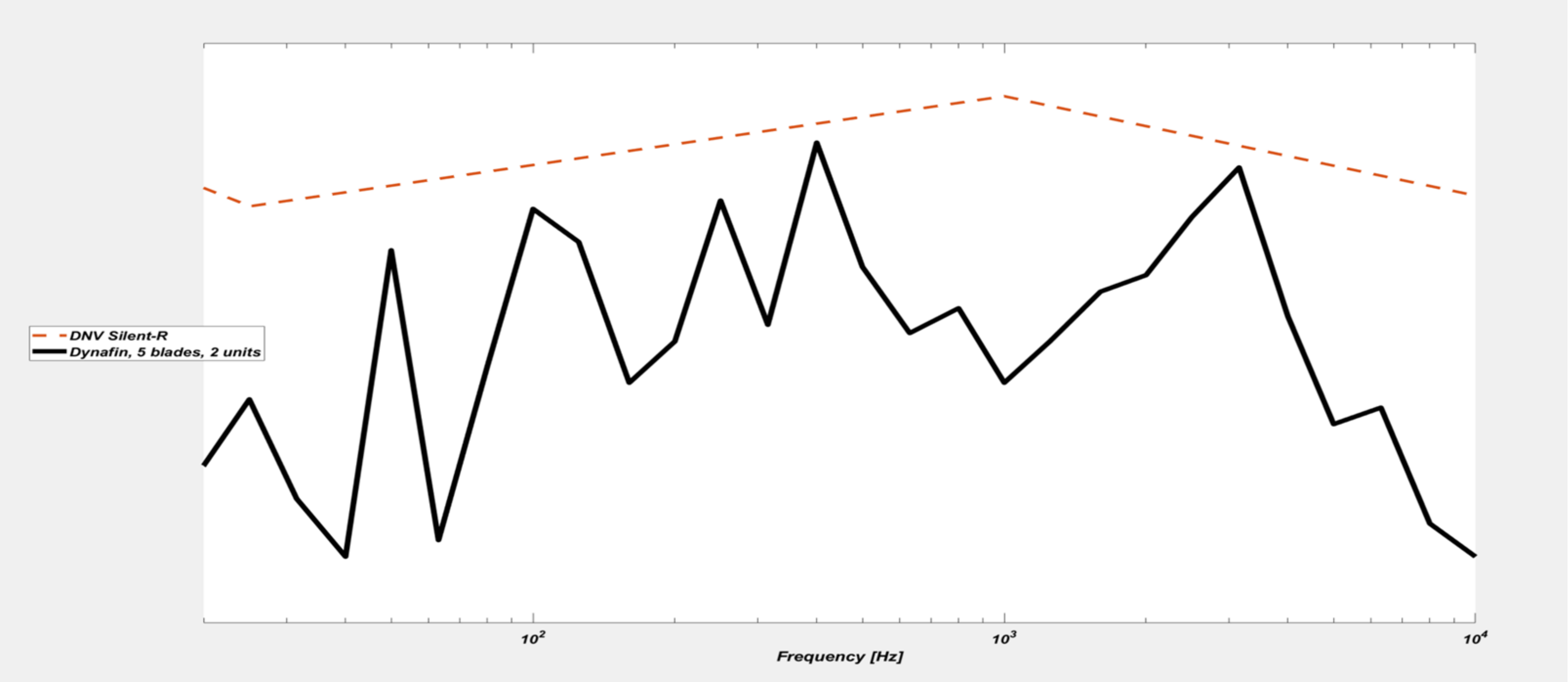
Dynafin offers significant noise reduction advantages, critical for research vessel operations:

Low RPM & Blade Loading: Operating at low rotational speeds with reduced blade loading minimizes the risk of sheet cavitation, a primary source of broadband noise.

Tip Vortex Cavitation Mitigation: Blade tips are positioned far from the hull, where the wake field is uniform. Combined with low blade loading and low effective velocity, this configuration effectively suppresses tip vortex cavitation, a source of low-frequency noise.

Motor Placement: The main motor is housed inside the vessel, reducing the transmission of electric noise into the water—subject to hull structure design.

Blade Motor Design: Blade motors that potentially could radiate noise via the blades to the water are specifically optimized for low acoustic emissions



Preliminary electric underwater noise simulation results in 1/3 Octave bandwidth

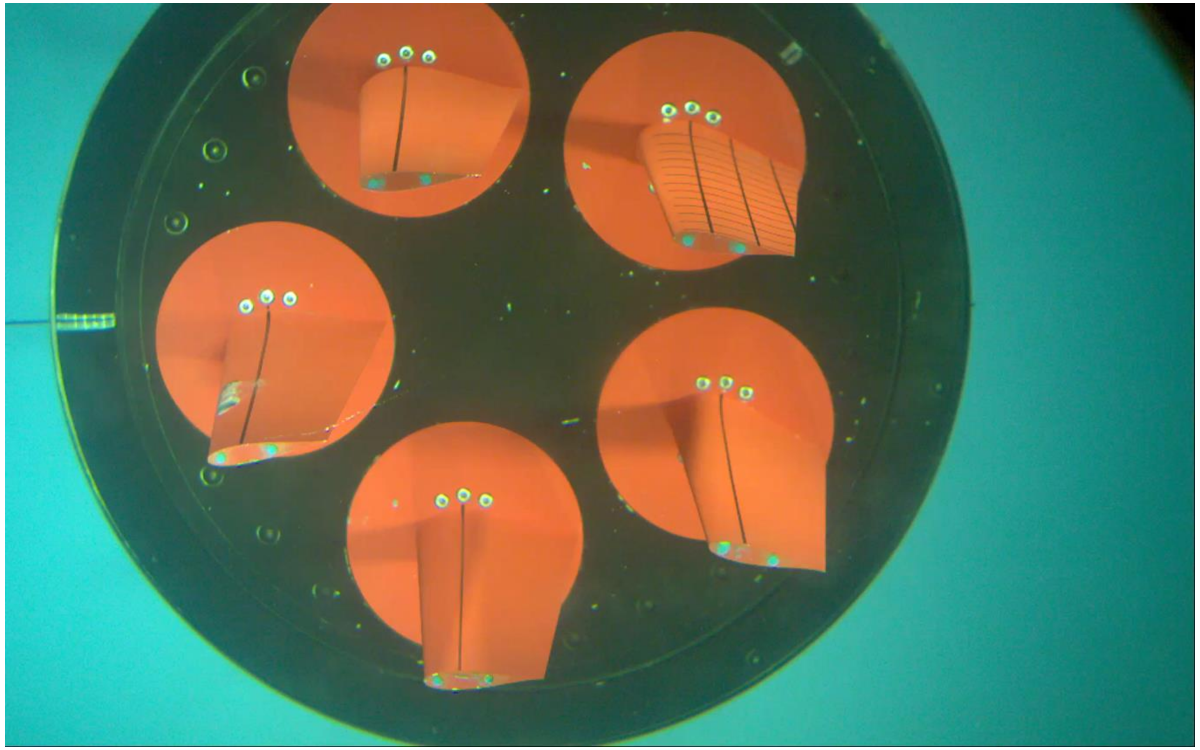
Cavitation

Cavitation may occur during high-load conditions such as:

Full-speed transit in rough seas

High-power DP operations

To ensure reliable performance, cavitation testing is conducted to visualize cavitation patterns and measure associated forces and moments. While moderate cavitation is generally harmless, excessive cavitation can reduce thrust and increase fuel consumption.



Cavitation Mitigation Strategies:

Increase blade span to reduce blade loading

Optimize blade shape and cross-sectional profile; increase chord length

Adjust pitch trajectory for improved flow characteristics

Adjust the wheel rotation rate

Ventilation robustness

Traditional azimuth thrusters may experience ventilation issues, leading to:

Sudden torque changes

Propeller racing

High mechanical loads and power plant instability

Even though the Dynafin is not completely immune against ventilation the cycloidal path combined with long blades where tip is far away from sea surface reduces the risk of significant ventilation

Unlike traditional propellers, the cycloidal motion does not pull air downward, resulting in significantly reduced ventilation at the blade surface

In addition, the high inertia of blades and main motors prevents propeller racing, offering superior robustness against ventilation effects to the powerplant.

Additional benefits of Dynafin propulsor

High Responsiveness: Enhanced control during DP operations. The direction of thrust can be changed in matter of seconds. As comparison, an Azimuth thruster requires 10-15 s time to turn 180 degrees depending on steering rate

Rudder mode: The Dynafin can be used in active or passive rudder mode with almost zero power consumption

Energy Regeneration: Efficient energy recovery capabilities- Beneficial for vessel with additional thrust source like sails.

Software-Driven Features: New functionalities can be introduced via software upgrades, no need to make changes to the hardware

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