

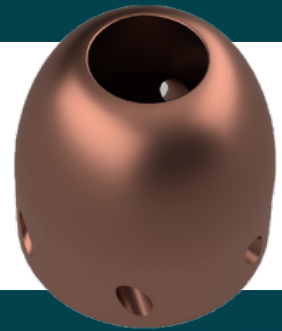


EcoNavis Solutions

PROPELLING A GREENER FUTURE

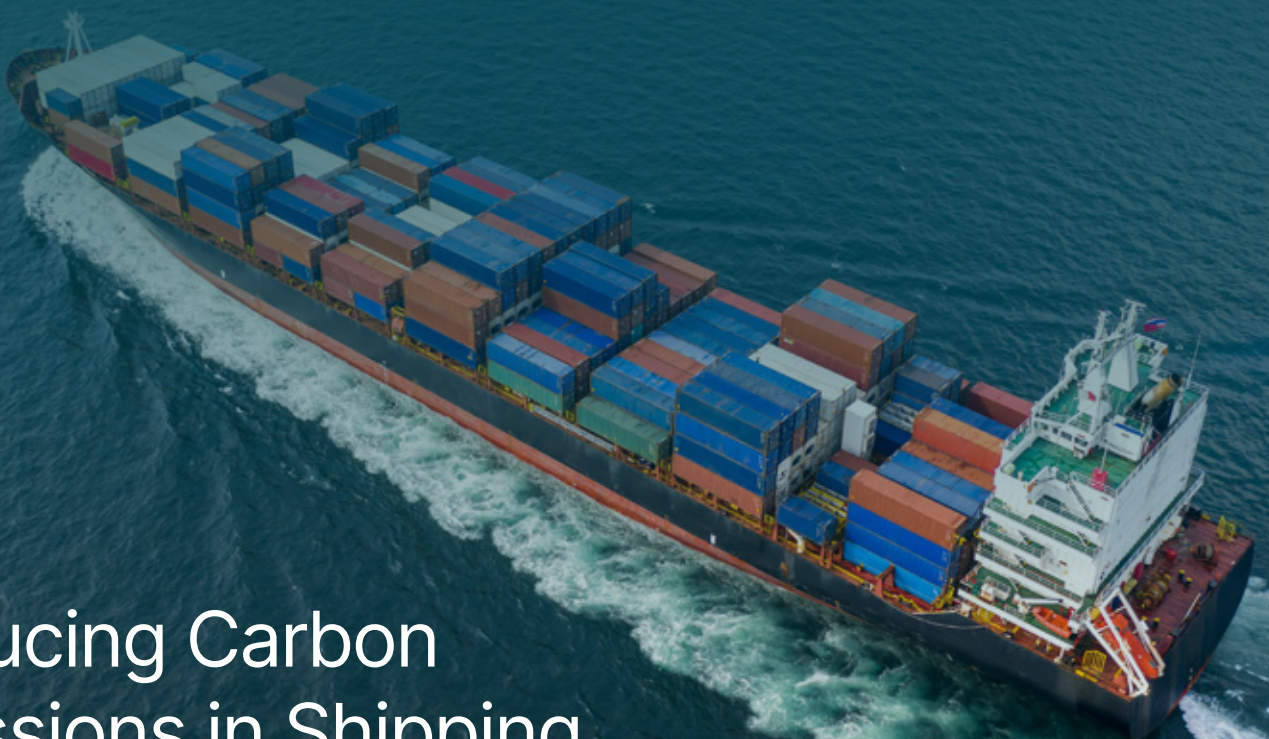
Eco Boss Cap: The Future of Propeller Efficiency

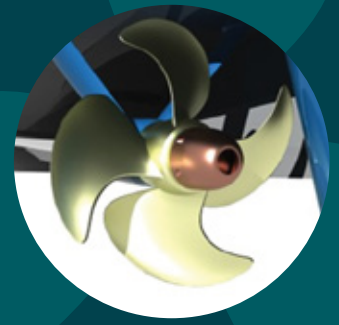
A cost-effective solution to reduce fuel consumption and carbon emissions.



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Reducing Carbon
Emissions in Shipping





THE Eco Boss Cap

What is the Eco Boss Cap?

The Eco Boss Cap is an innovative propeller boss cap that optimises flow dynamics improve propulsion efficiency, resulting in fuel savings and carbon reduction.

Up to 5% energy efficiency increase, dependent on ship type and operational profile.

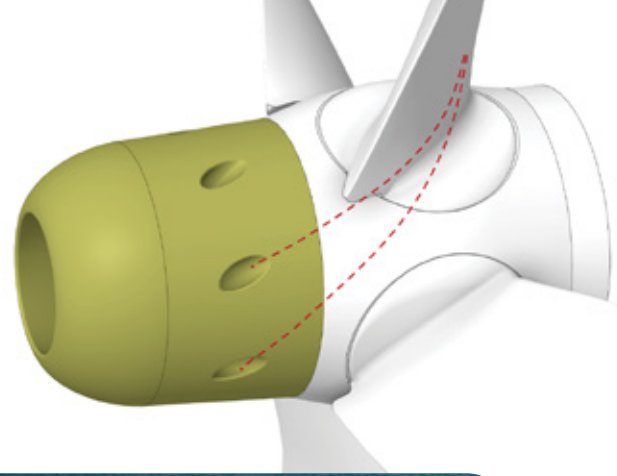
The Eco Boss Cap cuts CO₂ by up to 4,500 tonnes per year from a 300 m vessel. Equivalent of removing 1,000 cars annually from the roads.

Reduces Under Water Noise & Rudder erosion.

Why the Eco Boss Cap?

- | | | |
|----|---------------------------|---|
| 01 | Regulatory Pressure | Stricter IMO guidelines require compliance, or ship owners may face fines and operational restrictions. |
| 02 | Rising Fuel Costs | Propeller efficiency improvements can lead to significant fuel savings, thus improving profitability. |
| 03 | Sustainability Leadership | Emission reductions enhance a company's reputation, aligning with global sustainability initiatives. |
| 04 | Competitive Advantage | Energy-efficient ships enjoy lower operating costs, increasing fleet profitability and market preference. |

THE Eco Boss Cap

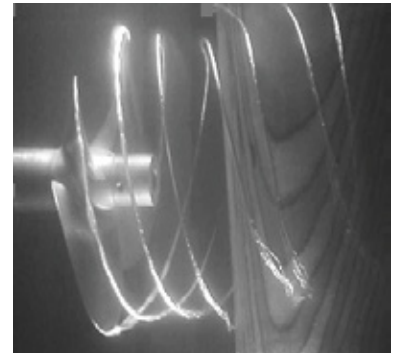
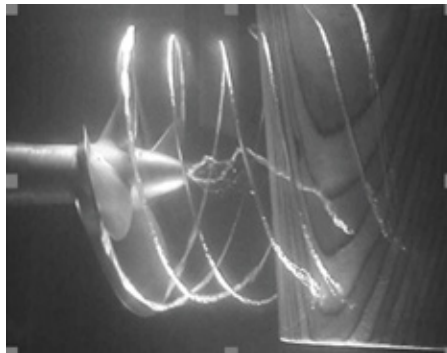


How does it work?

- Reduces propeller hub vortex cavitation and minimises associated efficiency loss.
- Optimises flow pressure by redirecting high-pressure flow through pressure relief holes.
- Eliminates the need for propeller boss cap fins with Innovative chamber and hole features reduces the material weight.
- Performs effectively in various operational conditions, whether it is ballast or laden, offering a practical solution for different vessel types.

CFD Simulation, Optimization & Validation

Background

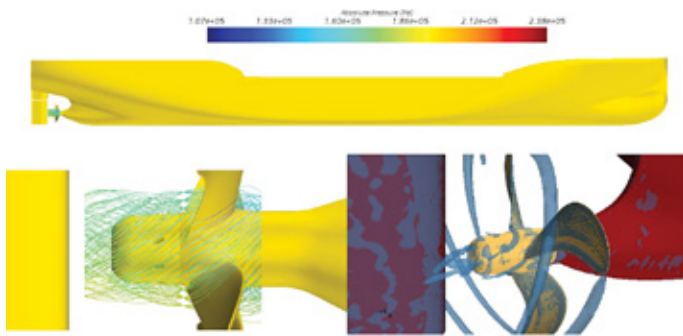


Five different boss caps were designed and tested without and with the presence of a rudder at the Emerson Cavitation Tunnel of the Newcastle University, in “reverse pod condition”.

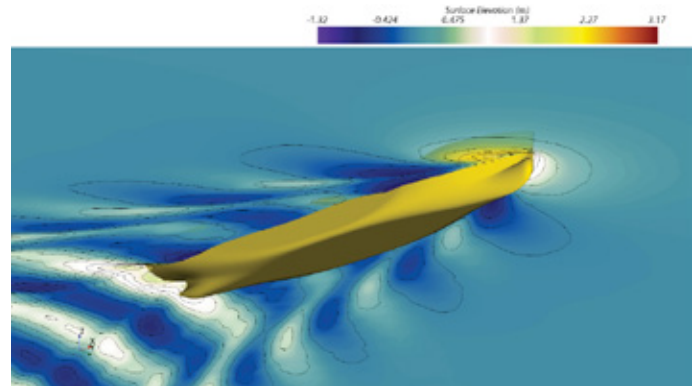
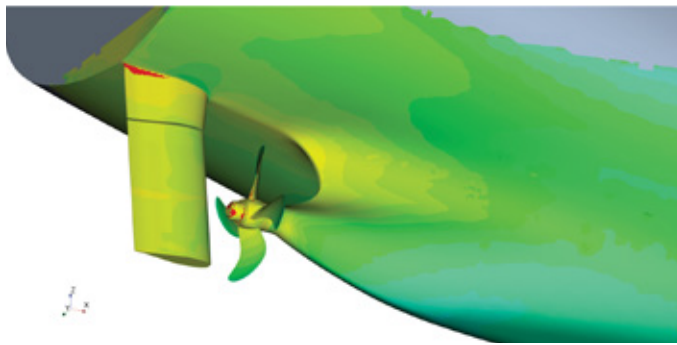
Standard cone shape, a cylindrical shape and three cylindrical caps with fins, trailing edge flaps and slots.

Cavitation characteristics for all the caps tested indicated the most favourable performance with the slot type cap with a considerable loss in the propeller efficiency requiring further investigation.

CFD Simulation, Optimization

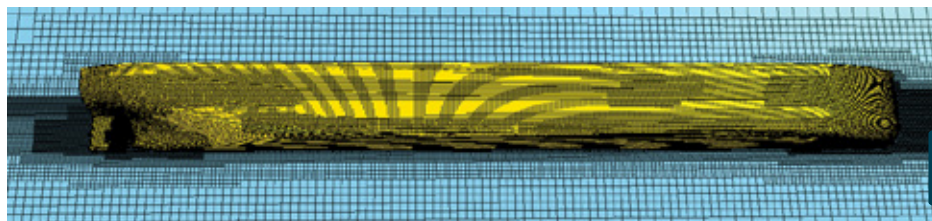


1. High Fidelity Optimization to enhance propeller efficiency and performance.
2. CAESES parametric model
3. StarCCM+ High Fidelity CFD Simulations
4. Improve Propulsive efficiency
5. Reduce Cavitation volume

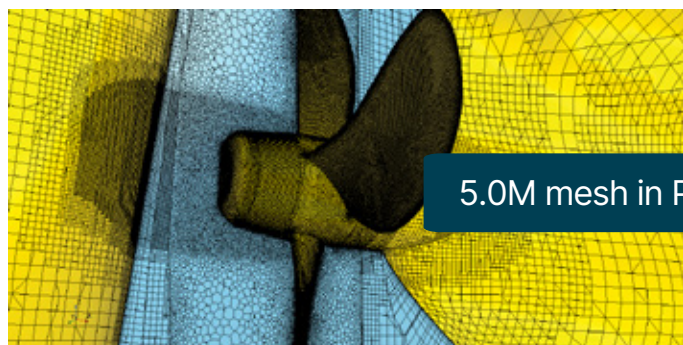


The calculations were conducted for the full-scale ship
Free-surface effect included at the design speed (16.46 knots),
Propeller's design pitch angle.

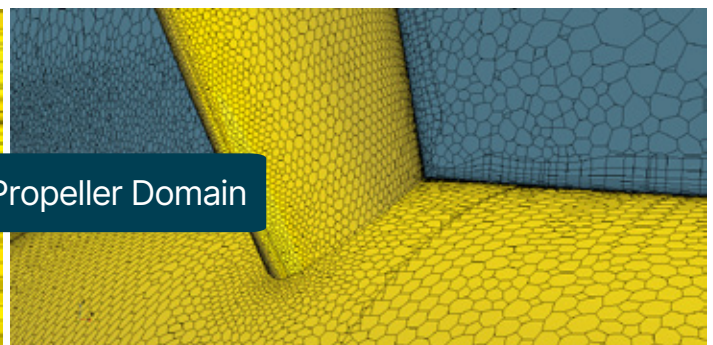
Considering the purpose and computational cost, the average Y+ value is aimed at 50.



6.6M mesh in Hull Domain



5.0M mesh in Propeller Domain



Solver Settings	Unit	Base Boss Cap	Design V1	Design V2	Design V3
Propeller Thrust, T	kN	584.4	538.3	582.0	553.1
Propeller Thrust, Q	kN.m	505.9	495.3	496.5	486.4
Propeller Thrust, N	RPM	103.5	102.3	102.5	102.8
Delivered Power, P_D	kW	5483.4	5306.1	5329.3	5236.2
Power Saving	%		3.3%	2.9%	4.7%
Boss Cap FX	kN	75.36	75.43	74.77	75.20
Boss Cap M	kN.m	0.213	0.076	0.017	-0.044
Rudder FX	kN	-18.79	-19.25	-18.84	-19.42
Rudder FY	kN	-4.58	-2.44	-3.80	-1.20

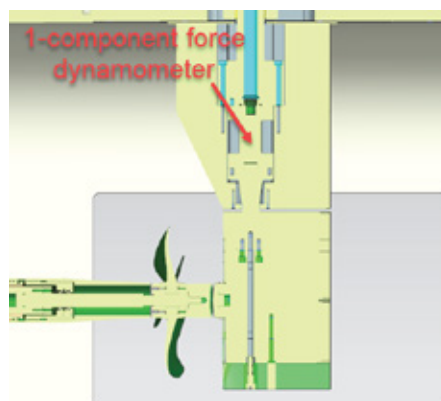
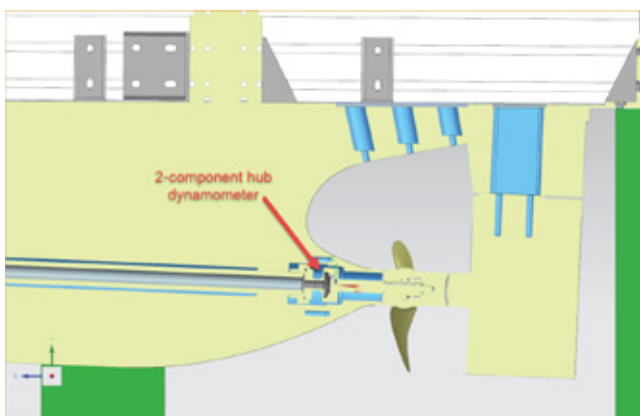
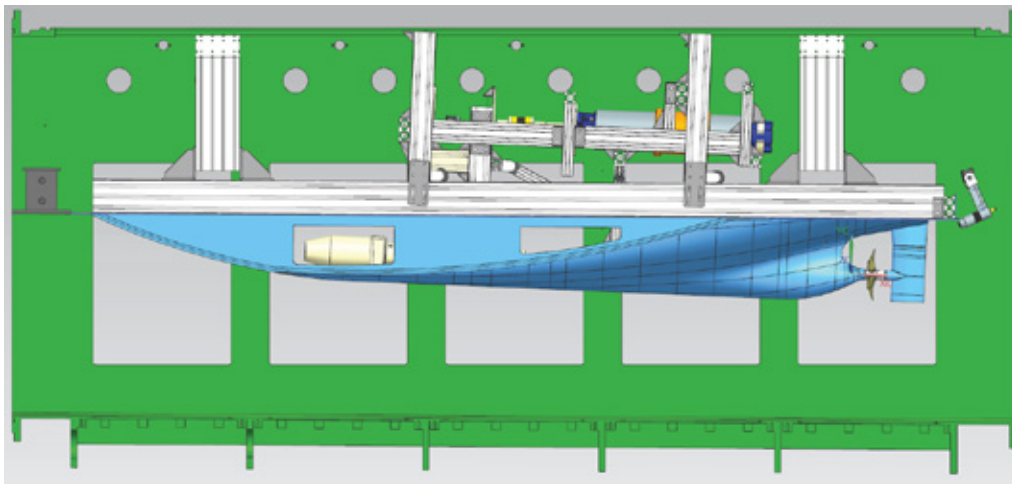
Validation Test: Open Water Tests



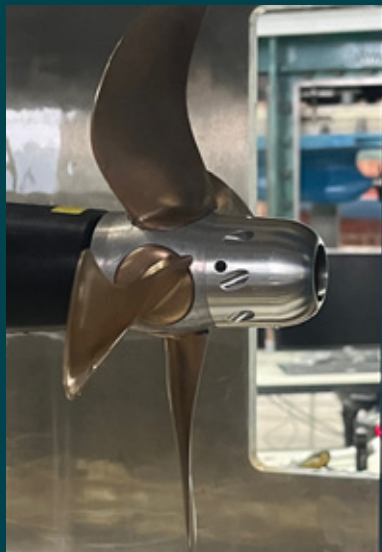
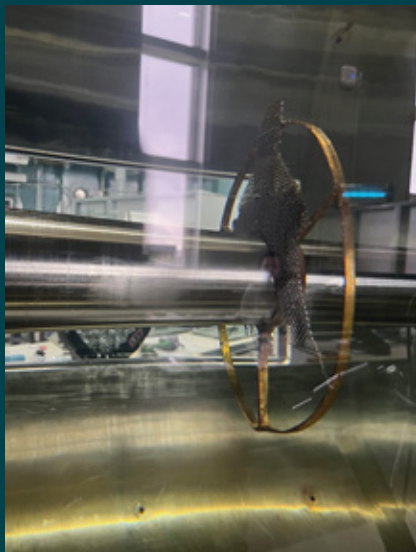
Cavitation Tunnel T-31	
Kempf & Remmers – Hamburg	
Build year	1970
Tunnel volume	394 m ³
Drive engine	1000 kW
Total height	12 m
Total length	23 m
Measuring section	
Height	1500 mm
Width	800 mm
Length	4 m
Water velocity	12 m/s
Absolute pressure	max 100 kPa min 5 kPa

Cavitation Tunnel T-32	
KMW	
Build year	1970
Tunnel volume	117 m ³
Drive engine	250 kW
Total height	8 m
Total length	14.5 m
Measuring section	
Height	800 mm
Width	800 mm
Length	2.5 m
Water velocity	14 m/s
Absolute pressure	max 200 kPa min 15 kPa

Validation Test: Dummy Hull



Validation Test: Behind Wake Screen

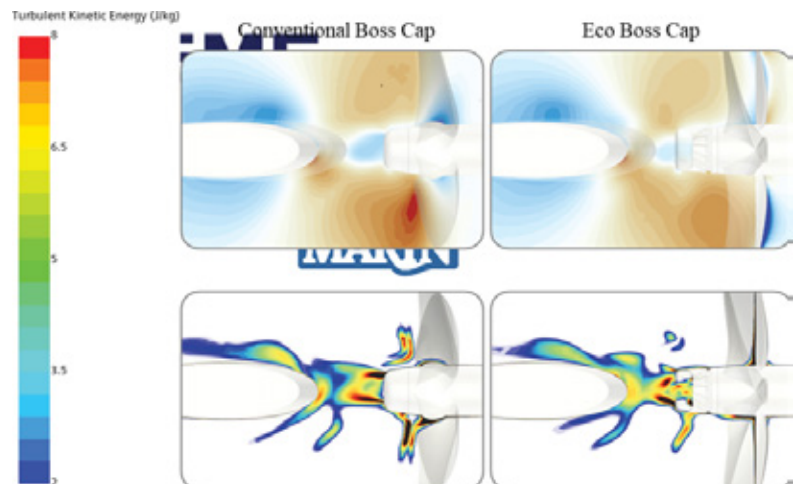
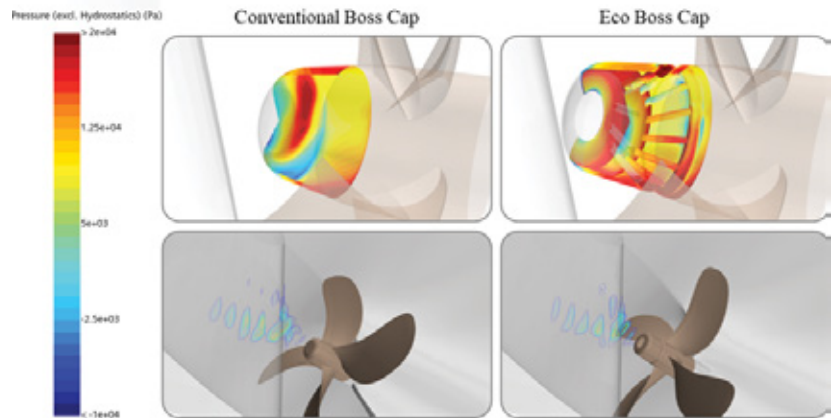


Towing Tank Test



Pd [MW]	Setup	Efficiency
10.158	Stock propeller + Stock rudder + Stock hub cap	
9.826	Optimized Propeller + Stock rudder + Eco Boss Cap	-3.27%

Pilot Installations



Summary

Prototype Testing at Kongsberg Marine (TRL 6) shows up to 2.1% Propeller Efficiency Improvement

Towing tank test results showing 3.27% reduction in delivered power

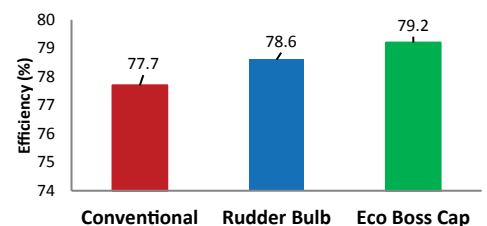
Patent application submitted September 2023

Patent Cooperation Treaty (PCT) in September 2024

Pilot Installation in Q1 2025 with Tsakos Energy Navigation

Innovate UK Funding of £300k at 100%

Rol of less than 6 Months





EcoNavis Solutions

PROPELLING A GREENER FUTURE

From CFD to Sea Trials:

Our Roadmap to Full Scale Adoption

01

DESIGN & CFD OPTIMISATION

Parametric modeling, High Fidelity Computational Fluid Dynamics Simulations for Optimisation and Detailed Manufacturing Drawings, geometry finalisation

02

MANUFACTURING & CLASS APPROVAL

Moulding, casting, machining, surface finishing; liaising with Class Societies.

03

INSTALLATION & TRIALS

Drydock scheduling, installation on Target vessel, pre and post-installation data comparison.

04

COMMERCIAL ROLL-OUT

Partnerships with major propeller manufacturers, distribution deals, route to broader market.

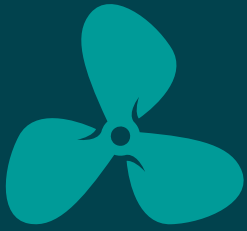
Environmental Benefits

Every voyage will count towards a greener future and our innovations will deliver measurable environmental advantages;

Cut CO₂ by up to 4,500 tonnes per year. This is based on a typical 300m vessel, which is the equivalent of removing 1,000 cars annually from the roads.

Reduce underwater noise & rudder erosion through the optimisation of water flow and turbulence around the propeller, our technology significantly reduces cavitation, benefits marine life and minimises rudder erosion, which in turn reduces maintenance costs and expands vessel lifespan.

Aligning with IMO 2030 Targets by lowering fuel consumption and CO₂ emissions, vessels can improve their environmental ratings, avoid penalties, and secure a competitive edge in a low-carbon shipping market.



EcoNavis Solutions

PROPELLING A GREENER FUTURE

Charting a Greener Future and How You Can Be Part of It

Eco Boss Cap can benefit ship owners who are looking to increase fuel efficiency

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