



DEALFENG

Dealing in wind



Est.2012 | WAPS R&D started in 2016

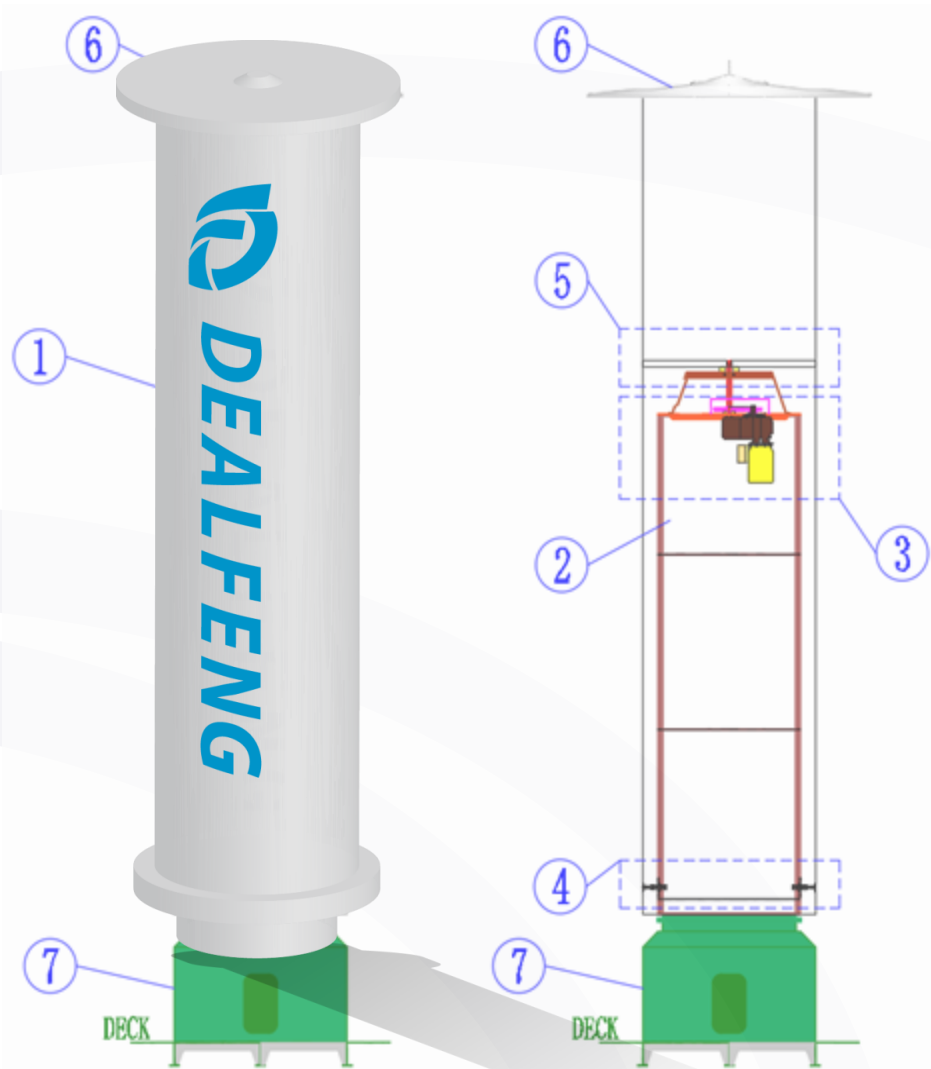
DEALFENG® Rotor & Wing Sails

R&D + Manufacturing of WAPS

3 Rotor Sails & 6 On-going

Wind Propulsion Systems harness the wind, which is the only free and inexhaustible energy source, to generate thrust and thereby act as a supplement to the ship's main engine power!

Dealfeng® Rotor Sail



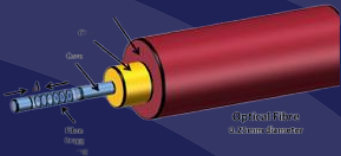
- ① **Outer Rotor:** composite material, placed on deck, rotates to harness wind
- ② **Inner Tower:** steel structure, supports outer Rotor & houses drive system.
- ③ **Drive System:** powers Rotor rotation
- ④ **Lower Bearing:** carries radial loads
- ⑤ **Upper Bearing:** carries axial & radial loads, links outer Rotor to inner tower
- ⑥ **Top Disc:** composite material with lightning protection
- ⑦ **Foundation:** connects inner tower to ship deck, transmits thrust to ship hull.

System Composition- Software

Dealfeng® Real Data Measurement System - Fibre Optics Sensing System for WAPS

- Design verification & optimization
- Real-time data for condition monitoring
- Reduced maintenance & inspection needs
- Continuous stress & load monitoring

	M/E power (%)	Fuel savings (ton/hr)	CO2 savings (tonCO2/hr)	Total Voyage cost savings (USD/hr)
Propulsion power without WASP	100	-	-	-
Propulsion power with WASP	49.12	0.605	1.936	617.1
Propulsion power with Insensys fitted WASP	47.1	0.630	2.016	642.6 (+4.13%)

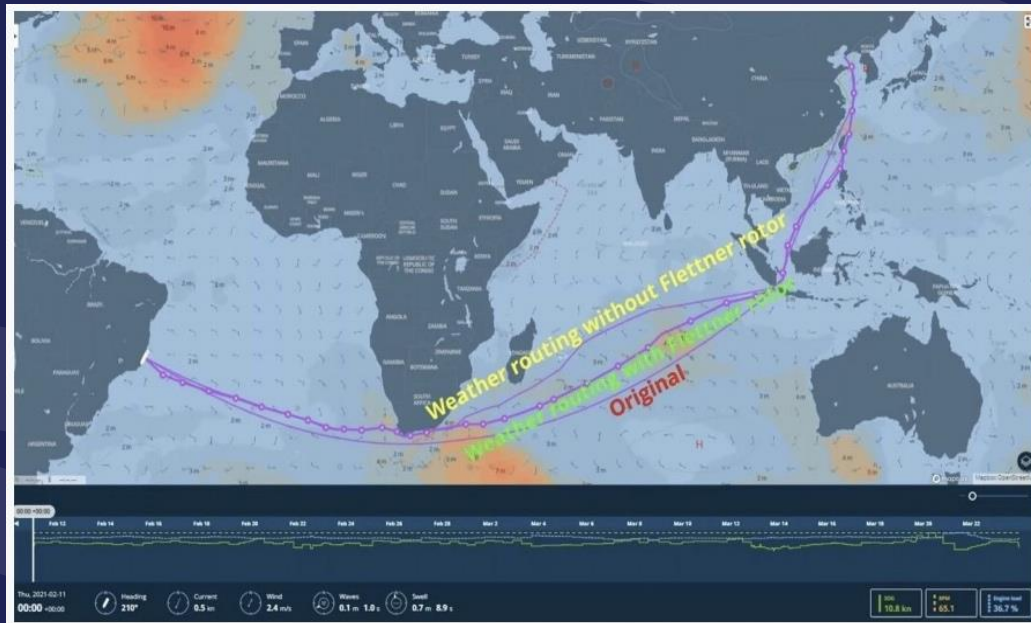


- +4.13% voyage profitability with sensors
- Certified by DNV, data verified by MVR
- Fully compliant with IMO (EEXI, CII)
- Eligible for MRV-certified carbon credits
- Supports Gold Standard (GS) transactions
- Helps avoid FuelEU Maritime penalties

System Composition- Software

Dealfeng® Route Optimization System

The optional service of Dealfeng is including route planning suggestion.



- Cooperate with NAPA
- Special design for WAPS vessels
- The fuel saving effect will be increased by more than 4%

Rotor Sail performance comparison on the specific route

Route	Brazil <-> China	
	Laden	Ballast
Installed DEALFENG® Rotor Sail, not combined weather routing	-16.7%	-14.2%
Not installed DEALFENG® Rotor Sail, with weather routing	-3.3%	-4.6%
Installed DEALFENG® Rotor Sail, and combined weather routing	-19.9%	-18.8%

Company References - 18,000 DWT Bridge Crane and Heavy Equipment Vessel (retrofit)



- Two set 4m X 18m fixed foundation Rotor Sail
- Annual average fuel saving rate 12% Savings
- Total height: 20.5m | Speed: 200 RPM | Design wind: 28 m/s
- The voyage of the vessel is coastal area of China, and the two-engine power is 6,176kW.
- Ship speed increased when turns on
- All requirements satisfies Class's regulations

Dealfeng® Wing Sail – Business case from partner Njord Solution

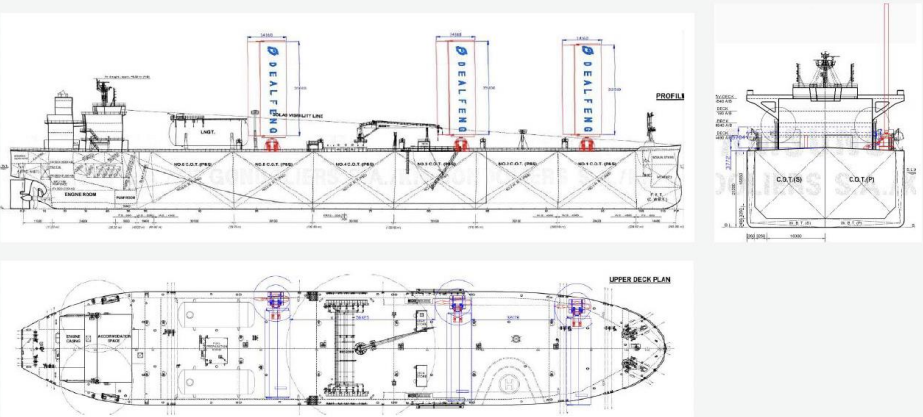
SHIP PARTICULARS

Ship Type	Aframax Tanker
Gross Tonnage	
Dead Weight	113k DWT
Machinery Details	
ME Type	WIN G&D 6X2DF
ME SFOC (MGO)	180.9 g/kWh
ME DMCR	11,200 kW
Fuel type	LNG (MGO Pilot fuel) or MGO

WAPS CONFIGURATION

The ship is equipped with 3 wing sail units with the aerodynamic dimensions 14.16 x 35m (chord lenght and height)

Illustrations of the WAPS configuration with 3 sets of 14.16 x 35m tiltable ATEX wing sails on the ship:



The close placement of WAPS units leads to significant aerodynamic interaction effects, which are not reflected in Dealfeng's performance figures. These effects will negatively impact the business case.

Business case

Business case for Aframax Tanker

Annual Savings potential from the WAPS configuration

Savings potential	MT CO ₂ per year savings	MT Fuel savings
21.8%	3975	1242

The above saving percentage is the average expected saving from statistical weather data and a study of the WAPS performance on the specific route.

Actual savings will depend on actual weather and how the ship and crew manage the utilization of the technology.

Financials

Return of investment in years

2.3

Total investment USD*	Yearly savings USD
2.85M	1.25M

Yearly bunker savings USD	EU ETS savings USD	FuelEU savings USD
878M	153k	217k

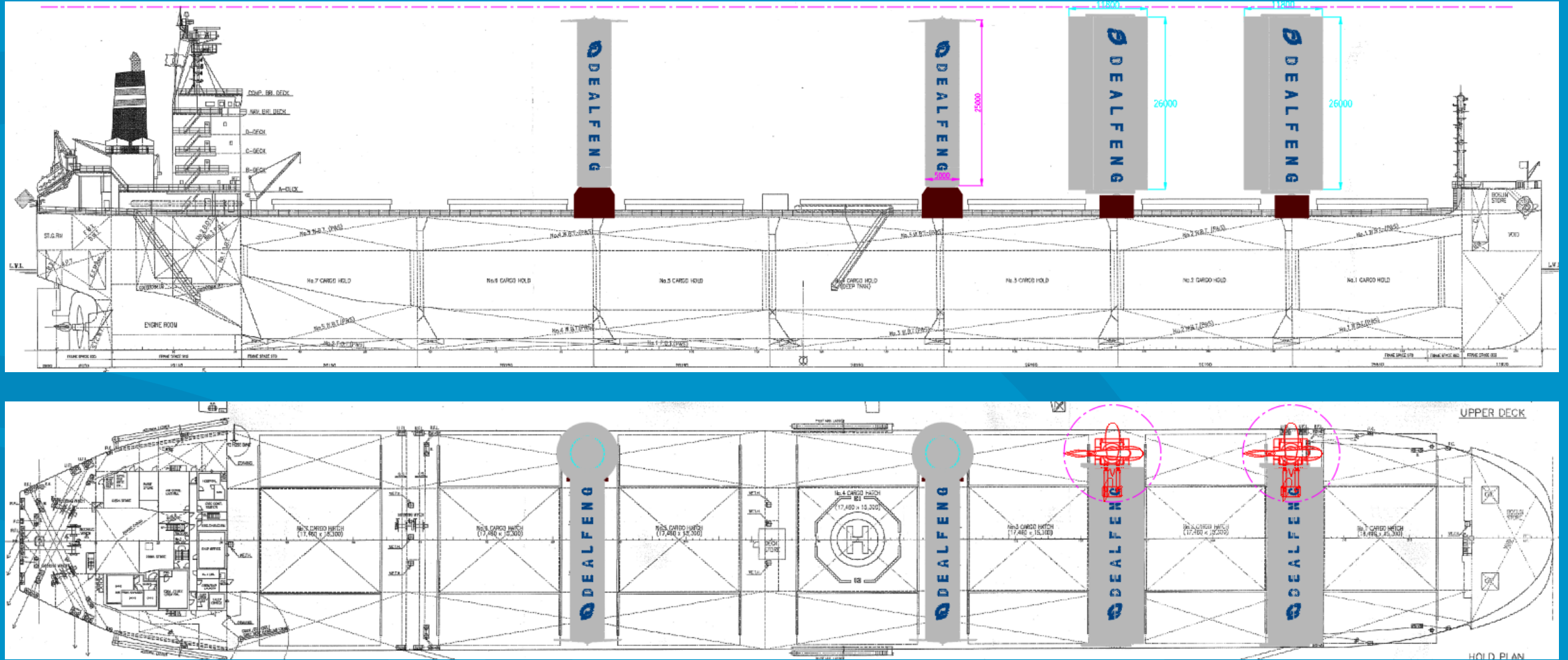
ROI will be significantly worse when interaction effects are accounted for. This is further described under prediction accuracy and FuelEU Maritime savings sensitivity in the discussion. In addition it should be mentioned that the routing is very favourable towards WAPS. As this type of ship rarely follows fixed routing, it should be noted that the ROI will increase if the ship deviates towards less favourable routings.

Bunker prices, as mentioned in the assumption section of this report, have been considered for calculation of yearly bunker savings and return on investment time.

The fuel EU savings are the average savings over the whole payback period considering the change of GHG intensity limit over time.

Combination WAPS solution

Arrangement Scheme: 2 sets 5x25m Rotor Sails + 2 sets 11.8x26m Wing Sails



Combination of Rotor Sail & Wing Sail, it can reduce motor power consumption incurred by the WAPS operation and fully harness the power of wind along sailing routes to gain better aerodynamic performance, estimated to achieving at least 15% of average annual net savings on main global trade routes.

Pay By Sail – Minimize Your Risk

YOU BUY THE FUTURE, WE PAY THE RISK



Pay a percentage of downpayment

Pay the remaining by actual saving on fuel and CO2

THANK YOU



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