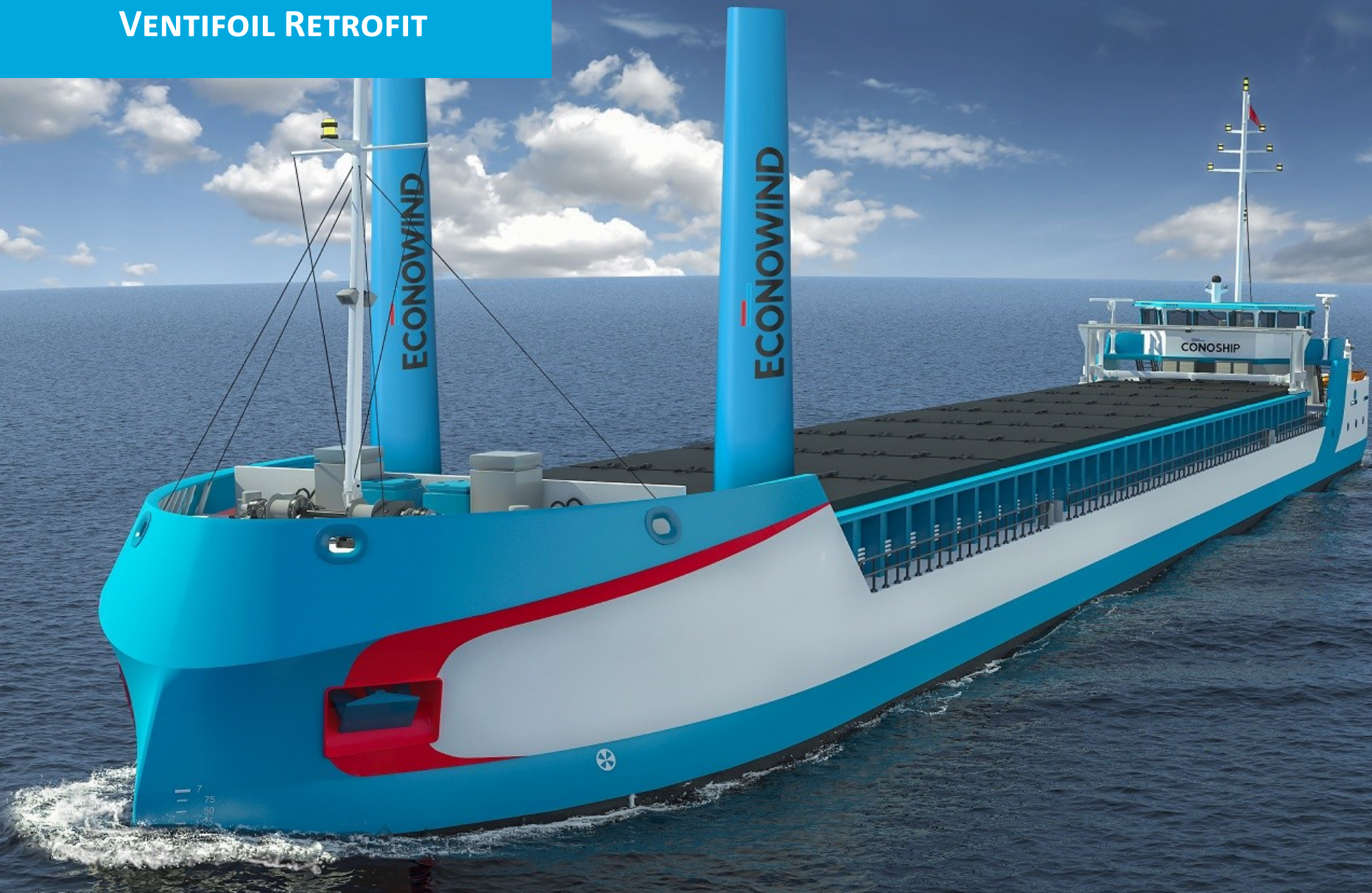


VENTIFOIL RETROFIT



Wind Assisted Ship Propulsion

ECONOWIND

Autonomous 10 - 16 meter foldable eConowind VentiFoils
Over 200 kW feasible power reduction on propulsion per unit



Design Rationale Retrofit Ventiloids

The eConowind Ventiloids are bolted on a steel foundation from which a folding 'VentiFoil' can be deployed: a ridged 'aspirated wing profile' acting as a sail. The VentiFoil is designed as an optimal compact (non-rotating) wing profile, creating superior thrust by means of the principle of 'boundary-layer-suction', for which ventilators are mounted in the VentiFoil.

Due to the generated thrust by the Ventiloids, the thrust of the propeller can be reduced to maintain the same speed, see figure 2. This leads to fuel savings and emission reductions of 10 to 30%, depending on vessel type and number of VentiFoil, which brings us closer to IMO's goals on reduction of carbon emissions.

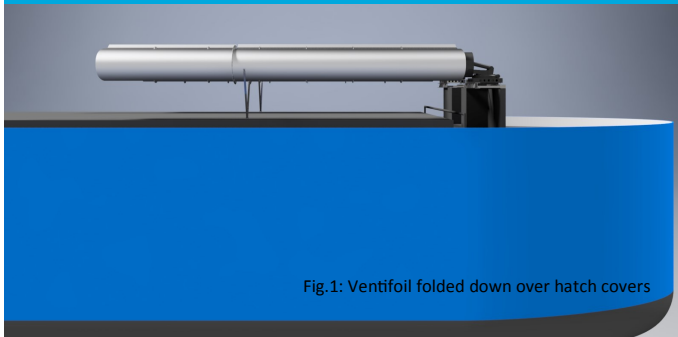


Fig.1: VentiFoil folded down over hatch covers

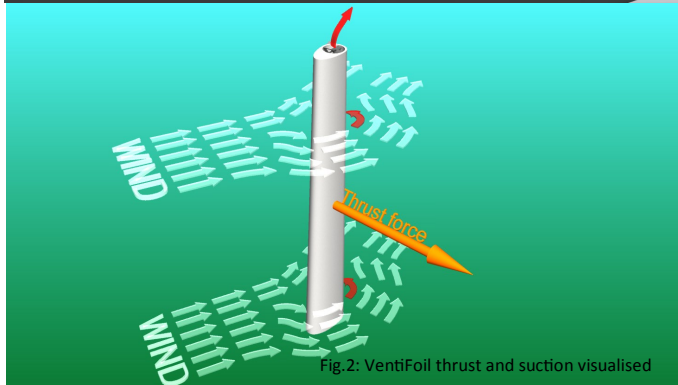


Fig.2: VentiFoil thrust and suction visualised

Installation

The eConowind VentiFoil system can be very easily retrofitted on existing vessels, the VentiFoil is provided with a dedicated foundation. The eConowind Ventiloids are mounted on a rotating platform, enabling high flexibility when air draft is critical.

For new vessels Conoship can integrate VentiFoil in the design on dedicated positions.

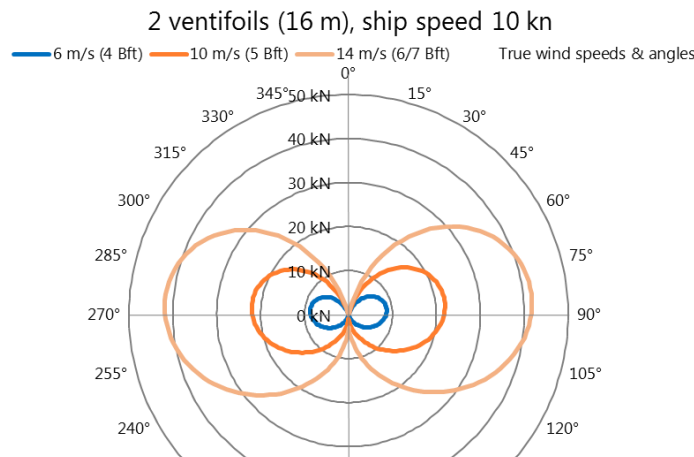


Fig.3: VentiFoil Thrust force compared to ships heading

Autonomous operation

From a remote panel the Ventiloids can be closed or initiated for operation from the bridge. The system senses the wind speed and -direction and autonomously deploys the VentiFoil, adjusting the ventilator power and optimizing the angle of each VentiFoil relative to the apparent wind.

In heavy and/or unfavourable wind conditions the Ventiloids are closed down automatically, minimising crew efforts and ensuring safe operations.

Main particulars

<u>Dimensions (above mounting point)</u>	
Deployed	11.3 - 17.3 m
Closed	1.6 m
VentiFoil	2.2 * 1.3 * 10 (16) m
<u>Weight (Two Foils)</u>	
	7000 kg
<u>Centre of Gravity above foundation</u>	
Deployed	3.1 m
Closed	0.7 m
<u>Material</u>	
Foundation	Steel
VentiFoil	Aluminum

Electrical particulars

<u>Power demand</u>	
Main power supply	Ca. 38.0 kW
Ventilators	2x 15 kW
<u>Voltage</u>	
	3 phase, 400-460 V @ 50-60 Hz
<u>Control unit</u>	
	Phoenix Axio-line PLC
<u>Frequency controller</u>	
	2x Schneider Altivar

HPU operations

Power demand dual pump	8 kW
Hydraulic actuated bearing speed	2 rpm
Folding time	5 min

Operational conditions

Max. operational apparent wind speed	17 m/s
Thrust (max. continuous)	40 kN