

OCEANWINGS: IMPROVING MERCHANT VESSEL EFFICIENCY



The environmental impact of shipping is huge with merchant ships carrying 90% of world trade and emissions set to increase twofold by 2050. VPLP Design in partnership with CNIM and in collaboration with Gurit is looking to minimize this impact while providing merchant vessels with cost competitiveness.

Oceanwings® are an automated reefable, furlable wingsail designed for use on large vessels to assist with fuel economy and performance. The sails can be controlled by phone or tablet alongside the vessels standard propulsion system. This enables the sails to be used with limited training or expertise and provides the vessel with reduced energy consumption and engine loading, in turn reducing the environmental impact.

Gurit was engaged early in the development, undertaking structural analysis on the two masts, boom, crane and ribs of the smaller Oceanwings® 2.1 prototype before providing structural engineering and manufacturing support in the development of the Oceanwings® 3.2.

BENEFITS TO MERCHANT AND LARGE VESSELS

According to Oceana, the shipping industry is currently responsible for more than 3% of global carbon dioxide emissions and is expected to increase twofold by 2050 as global shipping increases alongside global trade.

OVERVIEW

VPLP Design and CNIM worked with Gurit to structurally engineer the Oceanwings automated wingsail - a reefable, furlable composite sail system designed to reduce fuel use and emissions in commercial vessels. Gurit delivered advanced analysis and carbon fiber laminate design for the masts, boom, ribs, and crane, ensuring strength, stiffness, and controlled torsional flexibility. The resulting lightweight composite structure boosts vessel efficiency, cuts engine load, and enables fuel savings of up to 42%, helping shipping operators transition toward cleaner, lower-emission propulsion.

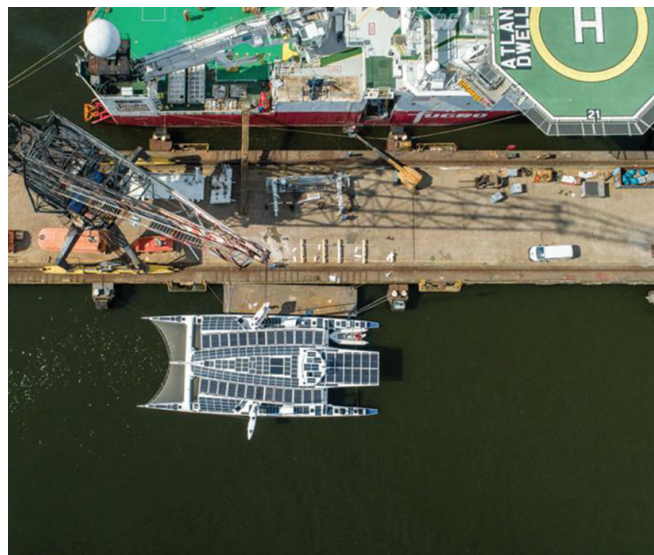
The development of Oceanwings® will help ease this and provide a win-win for everyone. Shipping companies are provided with increased operating efficiency with simulations showing a reduction in fuel use by up to 42%. Reduced engine loading provides further competitive benefits reducing maintenance and repair costs, all encouraging uptake. The public will benefit from a healthier environment alongside the merchant vessels as we see a reduction in global emissions.

STRUCTURAL DESIGN

In designing the Oceanwings® 3.2, Gurit was again in charge of the structural design for the two masts, the boom, crane and ribs, all of which were produced from carbon fiber laminate.

VPLP Design provided an initial concept and wind loads. Gurit engineers used this as the basis from which to develop a geometry and then a laminate which ensured the structure complied with strength, stiffness and stability criteria.

The secondary mast provided some challenges as it was required to be globally stiff but also offer torsional flexibility allowing it to twist and allowing the flap to open in order to generate superior wind force. As the wind speed at deck level and 15m above is not the same, the upper level needed to be able to twist and deform under load. Engineers overcame this challenge by using two benchmarks: one for the relative deflection to the main mast and one for the force required to twist the secondary mast. This allowed the engineers to find an optimum rigidity in the mast and a high level of efficiency when sailing.



The use of 3D numerical models was necessary to confirm that the overall structure (including the boom and crane) behaves as expected. Also undertaken was a Finite Element Analysis Shell Model which confirmed the wall thickness of the mast and boom was enough to resist buckling under load.

RESULTS

Two Oceanwings® 3.2 have been successfully installed on 'Energy Observer' a 30.5m catamaran with a 12.8m beam. Since equipped with the wingsails, Energy Observer has reported an improved performance with a reduction in motor electrical consumption (between 50% and 80% on average depending on sailing conditions).

Gurit looks forward to participating in the further development of this technology and its implementation on merchant vessels and superyachts.



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It has been a pleasure to collaborate with the Gurit engineering team on this project. Regular communication with Gurit’s experienced composite engineers helped us produce a simple and efficient design within the tight time frame of this project. Thanks to their in-depth understanding of how the composite industry works, Gurit’s support extended beyond the structural engineering of the wingsails, assisting us in finding manufacturers and providing technical support during the construction & assembly phases.



Nicolas Sdez (left), Project Engineering Lead at VPLP Design alongside the founder, Marc van Peteghem

