SMAR Azure Ltd

SA Evolution
OPTIMIZING FIBRE LAYOUT

SA-Evolution is a scientific approach to fibre layout.

SA-Evolution relies on robust AEROELASTIC ANALYSIS to help sail designers achieve maximum results from fibre membrane sails.

THE METHOD

SA Evolution combines all phases seamlessly: from design and fibre layout to aerodynamic, structural and aeroelastic analysis. Wind loads are applied onto the sail/rig configuration, deforming the sail and mast as an integrated structure. As the structure is deformed the sail shape changes so SA Evolution can calculate new aerodynamic data from the deformed surface. This changes the sail shape yet again and the procedure is reiterated until convergence is achieved between stress and rig/sail deformation.

STEP 1: Based on your design, the aerodynamic forces acting on the sail are computed, taking into account the presence and influence of the deck, the interaction of the main sail and headsail, as well as the influence of the sail's wake.

STEP 2: Then, 3D non-linear structural analysis is undertaken, computing the sail's deformed flying sail shape and the stress distribution, taking into account the initial fibre layout, content and modulus.

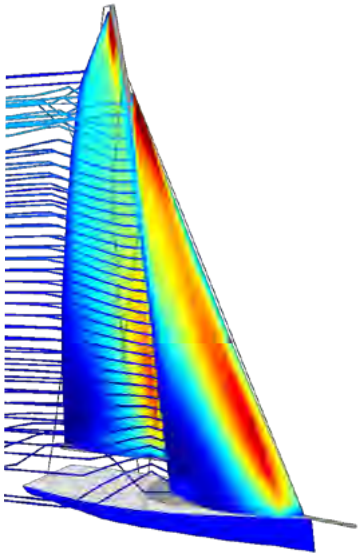
STEP 3: Possible variations in sail performance due to changes in the flying sail shape are estimated using 3D aero-elastic analysis.

STEP 4: An evaluation of the results enables the final optimization of the fibre layout, fibre content and modulus needed to ensure top performance for your design shape.

A scientific revolution is taking place in sail design

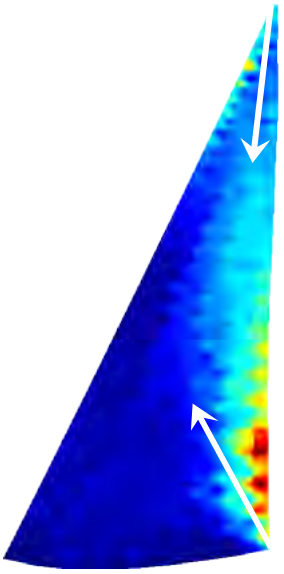
THE OPTIMIZATION PROCESS: 4 PHASES

Aerodynamic loads



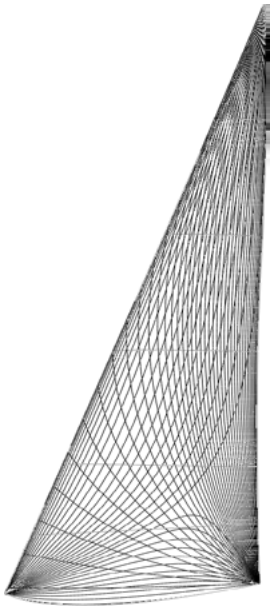
Calculation of the wind loads in any desired sailing conditions

Flying sail shape



Calculation of stress directions & deformed sail-shape under the wind loads, by taking into account the type and density of fibres

Principal Stress directions



Following the indication of the stress directions and intensity on the flying sail-shape, the optimal fibre layout is designed.

Optimal Fibre Layout

Comparing alternative combination of fibre types, layouts and sail-shapes, the resulting sail is faster, lighter and holds its optimal shape for longer.

"The optimization analysis for the TP52 mainsail and jib conducted for Dimension Polyant was specifically related to the structure of the sails, the goal was to reduce the weight of the sails whilst maintaining or improving their performance. The results of the analysis provided a formally engineered solution that is:

* Lighter, with improved shape holding
* Visually different and whilst form should follow function, aesthetics cannot be ignored
* Validated, which for me is the most important element since it creates a sound basis for discussions with clients, and informs the broader design process in a technically sound way".

Brad Stephens – Dimension Polyant

MAIN BENEFITS

Fully integrated design, fibre layout and meshing resolve any flaws occurring in the migration of data from one design system to another.

The comparison between principal stress directions and intensities calculated with alternative fibre types and layouts, allows the selection of the optimal fiber layout.

ABOUT SMAR AZURE

UK-based and founded 10 years ago by Dr Sabrina Malpede and Dr Alessandro Rosiello, SMAR Azure has grown substantially over the years in terms of its team of dedicated professionals, yachting-specific technology and product portfolio. Our R&D team comprises three expert software developers and three specialists in CFD and FEM/FEA. Our products and services have been chosen by over 180 clients in 27 countries and across various segments of the yachting industry.

Contact us to find out more:

sabrina@smar-azure.com

+44 (0)131 610 7627

www.smar-azure.com