Case Study

THE FUTURE OF FAST CRUISING

OVERVIEW

■ Industry
Marine
142ft superyacht

■ Target
Optimize the yacht and foil for minimum weight while ensuring the structure can support the dynamic load generated by the DSS foil

■ Solution
Development of a subtle blister around the foil exit to achieve greater bearing separation

■ Benefits
Anticipated increase in performance by 20% and a more comfortable cruise with a reduction in pitching motion

Engineering the first super-sailing yacht to feature the Dynamic Stability Systems foil technology.

Render of the Baltic 142, 142ft superyacht

The idea of implementing a Dynamic Stability Systems (DSS) foil isn't a new concept and has certainly been well proven on smaller, high performance racing yachts. However when Baltic Yachts and designers Farr Yacht Design decided to implement this technology in the much larger 43 metre Baltic 142 Custom super-sailing yacht it presented a range of new challenges.

Previous yachts equipped with the DSS foil have each prioritised speed over comfort. Shifting this paradigm to a yacht that provides unequalled comfort below deck provides limited space to invisibly integrate the foils support structure around the hull. As a result, early collaboration between Gurit, Baltic Yachts, Gordon Kay/ Infiniti Yachts, Farr Yacht Design and BAR Technologies was crucial to the success.

Restricted space for structural support

From a naval architectural perspective, designing a DSS foil into a cruising boat presents certain challenges. On the one hand, there is need for internal volume to ensure ample space for a comfortable interior. On the other hand, however, with 40 tonnes of lift being generated by the foil, less ballast is required and therefore the result is a lighter displacement and lower volume hull. Given that a reduction in beam would ultimately compromise the internal space, the consequence is to reduce the canoe body draught and/or the fullness of hull's section in order to reduce the immersed volume.

The impact of this lighter displacement hull ultimately creates a yacht with a relatively much smaller underwater section which in turn restricts the available space in which to house the support structure and mechanism for the foil.

Positioning the support bearings

Gurit engineers established during the early studies that it was going to be very difficult to support the required foil span within the limited space available for supporting bearings.

The sloping design of the hull exacerbated this by requiring the outer bearing to be installed a long way inboard to fit within the envelope of the hull. With this arrangement, the two bearings were too close to one another and needed to be pushed further apart to reduce the shear force and bending moment in the foil, and the loads in the bearings which would need to be supported by structure concealed beneath the owner's cabin.

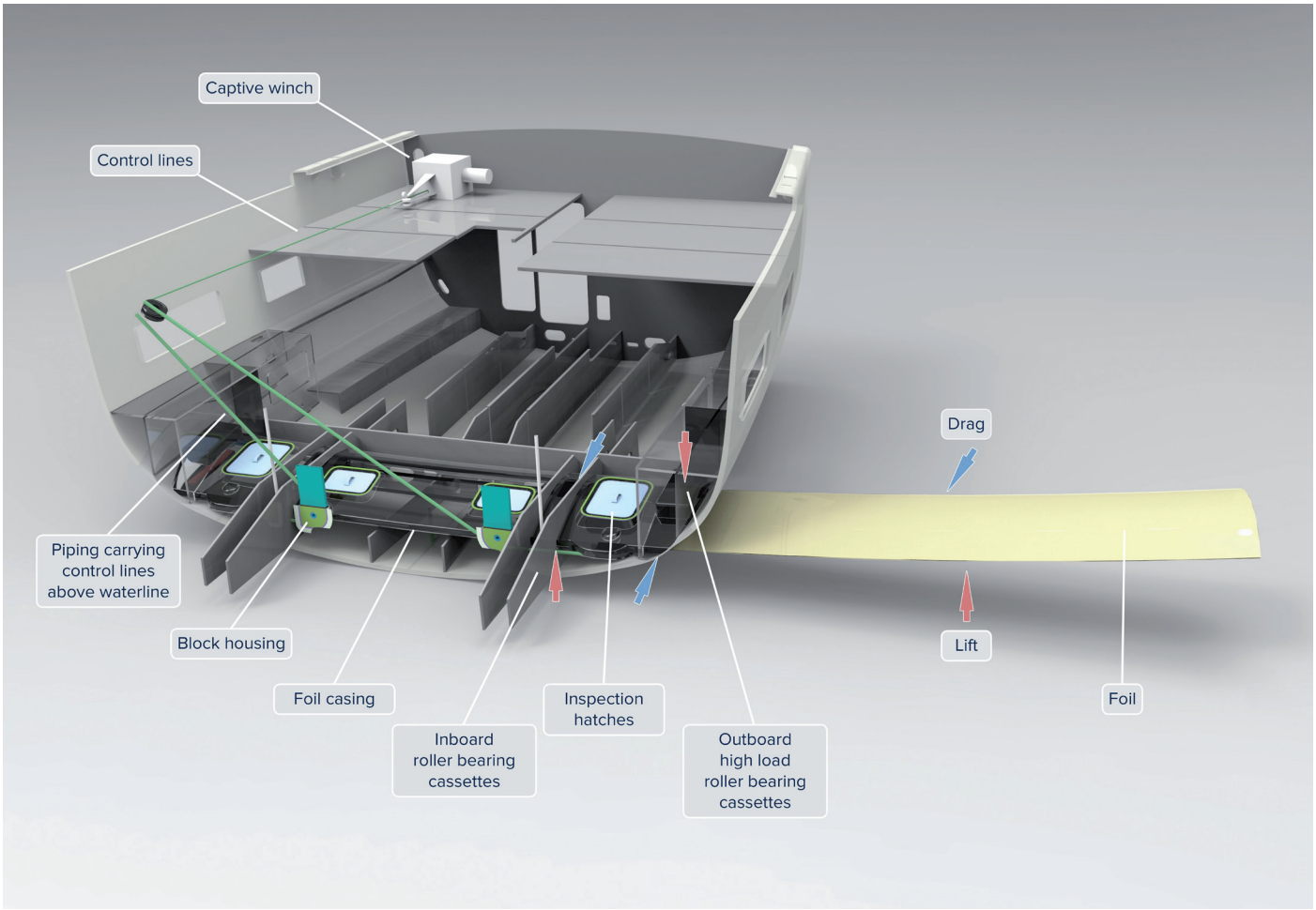
In developing a solution to distance the bearings from one another, Gurit engineers collaborated closely with Baltic Yachts to make small adjustments to the accommodation layout and with Farr Yacht Design to locally alter the hull shape, developing a subtle blister around the foil exit, capable of housing the outer bearing.

The results

Incorporating the subtle blister into the hull shape not only achieved greater bearing separation, and thus more manageable bearing loads (still as high as 200 tonnes), but it also enabled an increase in exposed span by moving the whole assembly slightly further outboard. Further to this, by changing the hull to foil interface shape the foil's lift characteristics were also improved. The end result of this was not only a more efficient structure but it also led to greater righting moment and an improvement in performance, all confirmed through CFD studies carried out by Farr Yacht Design.

With use of the DSS foil, the superyacht is expecting to see performance increases of 20% as well as a more comfortable cruise for passengers with both a reduction in pitching motion and heel angle

The yacht is under construction in Finland using Gurit SPRINT™ and Prepreg in combination with predominantly Corecell™ M Foam as structural core material.



Cross-section of Baltic 142 showing it's Dynamic Stability System (DSS)

Baltic 142 Custom

The Baltic 142 Custom is due for launch in 2019. It combines timeless, elegant looks with dramatic superstructure styling and a modern hull shape. It is set to feature a plumb bow and maximum beam carried well aft to enhance performance and provide useful hull volume.

Featuring the DSS, a 29ft 6in (9m) long sliding foil built into the yacht just below the waterline and deployed leeward, the Baltic 142 Custom is expected to be a high performance luxury blue water cruiser, capable of reaching speeds in excess of 20 knots.

About Gurit Composite Engineering

Gurit Composite Engineering is the specialist consulting arm of Gurit Group, providing independent services within the field of Structural Engineering for Fibre Reinforced Polymers (FRP) and Carbon Fibre Reinforced Polymers (CFRP) since the 1980s.

A core team of around 40 qualified and dedicated composite engineers in the United Kingdom, France and New Zealand offers independent composite engineering services to designers and manufacturers and has a solid track record of key engineering services for racing boats, superyachts, production boats, workboats, cars, buses, civil and architectural structures as well as industrial components worldwide.

About Gurit

The companies of Gurit Holding AG, Wattwil/Switzerland, (SIX Swiss Exchange: GUR) are specialized on the development and manufacture of advanced composite materials, related technologies and select finished parts and components. The comprehensive product range comprises fiber reinforced prepregs, structural core products, gel coats, adhesives, resins and consumables. Gurit supplies global growth markets with composite materials on the one hand and composite tooling equipment, structural engineering and select finished parts on the other. The global Group has production sites and offices in Switzerland, Germany, Hungary, Italy, Spain, the U.K., Poland, Canada, the U.S.A., Ecuador, New Zealand, India, Indonesia, and China. For more information, please visit www.gurit.com

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