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QUANTUM SAIL DESIGN GROUP

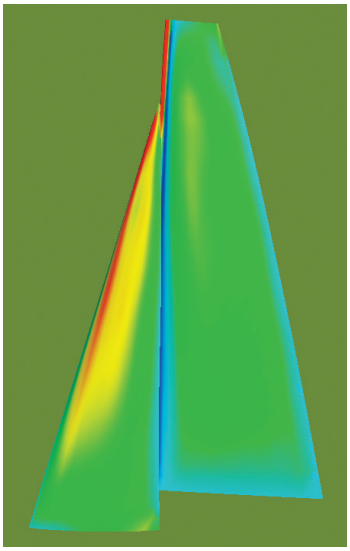
Technical Brief

Speeding up the design curve

How design software iQ Technology saves time and improves the final product...

'Technology is democratic because it always reaches the end user.' It's a favourite saying of Joan Subirats, Quantum Sails' head of technology in Barcelona. 'It also applies very well to what we're doing at Quantum, with the trickle-down of technology to all our customers.' At the top of the racing pyramid are classes like the TP52, where the Quantum Racing team recently won the world championship. But whatever lessons are learnt on the grand prix circuits get passed down to every other Quantum project.

The development of a sail package for the new Farr 280 One Design is a good example. Quantum's vice president of quality control, Andrew Scott, worked closely with Farr Yacht Design and Southern Spars in the early stages of the design. 'We took all their VPPs, all the rig dimensions – even down to all the rod values and how much the rod stretches – and we input this whole boat into our iQ Technology system in order to properly set up the rig for the first time. It was pretty important for us to be able to come out of the box with the right luff curve on the mainsail, the right geometry of the headsails, with us swinging hard, having done some good due diligence.



Initial CFD aero forces at 12kt

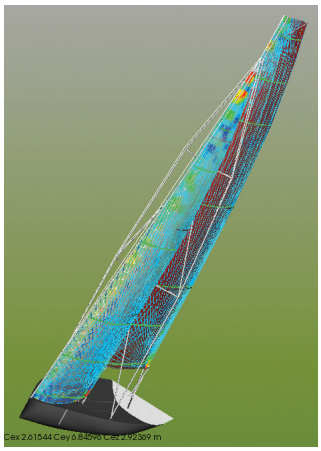
'The process from there was to trim the boat to what we felt was correct, based on what we have learnt from doing other programmes. We input rudder loads and mainsheet loads and then we see how much the mast is going to bend.' According to Scott, matching luff curve to mast bend is one of the critical success factors. 'The luff curves have to be perfect because with all the shapes and membranes – when the sails are built out of carbon fibre – nothing moves. So if you don't nail the luff curve the first time, then the sail is not going to look right and you are back into the loft for recuts in order to make it fit the boat. By using our systems we were able to nail that first time out, which was helpful for the guys on the boat. They could just pull it up, sheet in, and go.'

In the case of the Farr 280 Scott estimates that the iQ design process saved at least two or three trips back to the loft to adjust the luff curve. 'We probably removed one or two generations of sails from the design cycle because we knew where the fibres needed to be, we knew how the batten layouts and batten angles needed to be. The iQ system helps us figure out all those little things early, and get them right first time.'

Using powerful computational tools like iQ allows the designers to envision the flying shapes and work with more accurate data for a number of other key areas including:

- Designing jibs for the desired range of wind (fuller or flatter) and having the control of the luff curve, geometry (clew height, distance to spreaders, not touching rig, etc)
- Detailed analysis of headstay tension to design the mainsail. Having more defined fore-aft and side mast bend, so that the mainsail's luff definition is better.

Even so, however good the technology, people still matter, and you need a good sail designer to see the project through from start to finish. 'It is still a soft sail going into a hard surface, so it is never going to behave 100% the way you thought in the design program,' says Scott.



Stress, strain, loads and flying shapes are calculated in the Finite Element Modelling module

Enter Quantum's Jordi Calafat, 470 Olympic gold medallist and America's Cup winner with Alinghi, who has led the on-the-water sail development on the Farr 280. 'Obviously you still need human expertise,' says Calafat. 'When you are running flying shapes in iQ membrane, in reality you get one snapshot of the sail. Of course you run different conditions to see how it behaves when overpowered or underpowered, to make sure you have the right amount of luff curve, but what it gives you is a starting point. You start from a better position by having these tools; but for after this, as a designer, the most important thing is the communication with the trimmers. The better the input they give you, the quicker we can develop the sails to reach their optimum performance.' ❑

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