SLEIPNER'S NEW FINS

If you're looking for extra comfort at sea Sleipner's electric-powered radically curved Vector Fins could be a game-changer

The central task for any stabilising system is to make conditions on your boat more comfortable by reducing the likelihood of seasickness – and that's not quite the subjective issue you might imagine. Assessing the probability of seasickness involves a data-driven analysis based on the human body's average response to movement – or more accurately to acceleration. That comes in various forms as a boat moves on the water, including pitch, yaw, sway, surge and heave. But it's roll (side-to-side rotation) that is most critical to how you and your guests feel.

The centre of roll is of course quite low down, somewhere between a boat's centre of gravity and centre of buoyancy, so it stands to reason that you will experience greater movement on the flybridge than in the saloon. But by evaluating the average roll angle (in degrees) and the average roll period (in seconds), stabiliser manufacturers are able to judge with good accuracy the proportion of people who would be likely to suffer from seasickness in any given set of conditions. And by measuring those parameters in real time on board a test platform, with the stabilisers off and then on, they can also measure in percentage terms the effectiveness of their stabilising systems in reducing that figure.

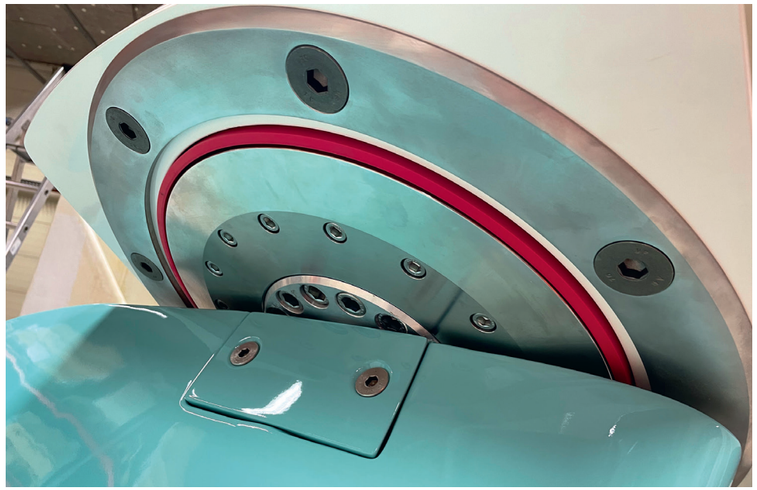
ABOVE: The fact that Sleipner conducts every element of the process, from research and development to design, manufacture and testing, means that issues are rectified in the factory rather than in the fleet

THIRD-GEN VECTOR FINS

Once a boat gets up to speed, stabilisation is relatively easy because water flow over the fins generates huge forces. That in itself sets a fin apart from a gyro, where the corrective force remains identical whether at rest or underway. But how do fins fare when the boat is sitting at anchor? In this case, your fins have to generate that water flow by paddling backwards and forwards, in the same way as you use your hands when treading water – and that's a much tougher job. After all, if a fin is flat (as established models have always tended to be), it generates a stabilising force parallel to the deadrise of the hull, which is typically little more than 20 degrees. And in rotating backwards and forwards, those lateral (rather than vertical) forces will often cause sway, where a boat jerks sideways with only minimal improvement in roll.

By using a curved design with a substantial upper cutout, however, Sleipner's Vector Fins are able to generate much more in the way of vertical force while incurring far less lateral resistance as they move backwards and forwards through the water. That enables these fins to carry out much longer, more effective strokes than their flat-fin competitors.

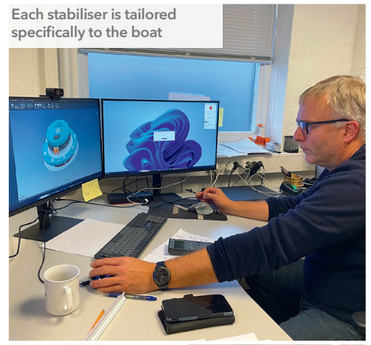
In fact, in its computational fluid dynamics analyses, Sleipner's incrementally improved third-generation fins have reportedly shown an increase of up to 122% in roll reduction forces, alongside a 60% reduction in forces generating sway and yaw (rotation around the vertical axis). And because of its uprated lift-to-drag ratio, Sleipner has also identified an increase of 145% in energy efficiency, which is particularly important if you want to run them all night at anchor, without flattening your batteries or running your generator. But beneficial though it seems to be, there's much more to this story than Sleipner's reinvention of the fin shape.



QUIET, RELIABLE GEARING

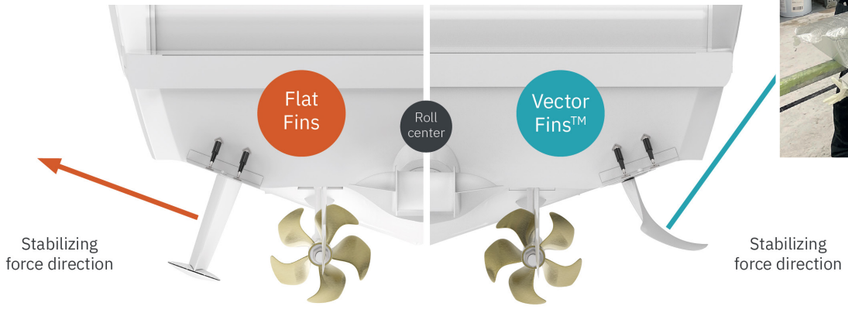
Sleipner's electric Vector Fins use a brushless torque motor, integrated in the actuator base, that is able to hold high torques over extended periods. They also feature an integrated Harmonic Drive strain wave gear to avoid the prospect of mechanical gearbox breakdown, which (in principle at least) could cause a fin to get stuck in a problematic position, making it very uncomfortable, or even hazardous, to limp home for repairs.

The idea behind all of this is very simple. Sleipner wants to match the safety and reliability standards of a hydraulic system without any of the complex and costly systems that hydraulics inevitably incur. But it also wants to minimise the noise issues traditionally associated with electric stabilisers, so it does that by eradicating the audible knocking caused by travel between gears; and it also does that by minimising sound transfer between the actuator and the hull. The moving, mechanical high-torque gears and motor are isolated from the boat itself with a stratospherically expensive gasket, built from



Each stabiliser is tailored specifically to the boat

Larger fins are reinforced with carbon fibre



ABOVE: While the flat shape of traditional fins can cause sway by exerting a 'stabilising' force parallel to the deadrise of a boat, Sleipner's relatively vertical forces are far more effective in minimising roll

a rubber-like substance that Sleipner is reluctant to tell us very much about. But according to the in-house technicians, it helps reduce structure-borne noise by an astonishing 92%. This is all well and good, we hear you cry, but how do these fins actually perform in practice?

THE IMPACT AT SEA

The data we gathered from our flybridge-equipped Fairline 65 test platform was telling. In typical anchoring conditions, with 1-2ft waves on the beam, we saw an 86% reduction in the average roll angle, alongside a remarkable 98% reduction in roll energy (the key indicator of motion sickness). When we put those waves on the starboard quarter, the impact of the fins was only marginally less effective, producing reductions of 80% and 97% respectively. It was during this second test period that we headed down below to listen out for the fins doing their stuff. And in the event, the noise levels proved so low that even when we got down close to the part of the hull where the fins were mounted, we struggled to discern any noise at all. In short, if you want to use these fins overnight, it's safe to say that you will not be kept awake by constant buzzing and clunks.

When we get back underway, it's also clear that these fins are not simply devices you turn on or off. On the contrary, you can set them at anything between 0% and 100%, which (according to the guys at Sleipner) provides plenty of controllability for people who want to retain a sensation of being at sea. Interesting though that concept is, it also brings an extra degree of controllability to those who like to manually deploy their tabs. After all, when you're underway with the fins working hard on 100%, any windage or heel will be actively dialled out by your stabilising system. Pitch, however, is not a dynamic over which the fins have any control so you can still manually

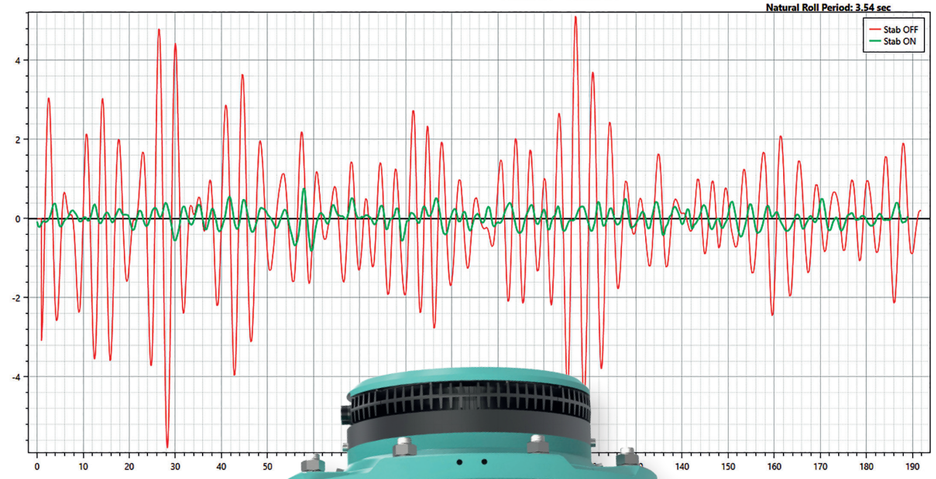
ABOVE AND RIGHT: Sleipner CEO Ronny Skauen demonstrated the company's electric fins on board a Fairline Squadron 65 in suitably challenging conditions

Blue SQ65, AtAnchor Test
AtAnchor 4 - Press day
Test date: 2 Nov 2023
Test engineer 1: Ronny
Comment: Typical waves for anchoring

Test place: Fredrikstad
Test engineer 2:

	Average Roll Movement	Average Roll Angle	Max Roll Movement	Max Roll Angle	Roll Energy (Indicator of sea sickness)
Stab ON	0.48 deg	0.25 deg	1.6 deg	0.83 deg	0.17
Stab OFF	3.56 deg	1.78 deg	10.61 deg	5.8 deg	10.1
Reduction	3.08 deg (86.52 %)	1.53 deg (85.96 %)	9.01 deg	4.97 deg	(98.32 %)

Average Roll Period Stab OFF: 3.99 sec
Natural Roll Period: 3.54 sec



LEFT: Compare the red line (stabilisers off) to the green line (stabilisers on) and the 98% reduction in roll energy is clear to see

deploy your tabs and alter your leg angles to fine-tune your angle of attack without any tangible impact from your fins.

On a similar note, whether underway or at anchor, another natural advantage these fins have over gyroscopic stabilisers relates to the management and delivery of their roll-reduction forces. Because while gyros can produce good results, particularly at anchor, they can only ever exert a corrective force once a wave has already tilted the boat off centre. By contrast, the stabilising activities of these fins are pre-emptive, as well as reactive, because the system measures and computes wave heights and roll periods in any given sea state to optimise its response to the next one that rolls through.

But it doesn't act on those patterns to quite the degree that it could. Instead, it stops short of attempting to eradicate roll entirely because wave shapes change, and pre-emptively overcompensating for a swell that, in the event, does not follow the established pattern, can in practice be less beneficial than stopping short. So instead of attempting to correct the roll angle to zero degrees, it aims for 0.25 degrees and the results, as illustrated by the data sheet above, are very difficult to dispute.

There are, however, limitations to what these fins (and indeed, any stabilisation system) can achieve. For instance, when sitting at rest, the fins were overwhelmed by an unexpected set of 8-footers that broke against the saloon windows and swept over the foredeck. And when a set of very short waves moved through, causing the boat to experience multiple peaks and troughs simultaneously, again the rewards we derived from the fin's stabilising activities were radically diminished. But even in these conditions, we saw a reduction in roll angle of between 30 and 69% and a reduction in roll energy of between 45 and 89%. And in more suitable conditions – either underway in the rough or at rest in more realistic anchoring conditions – the performance of these fins doesn't just generate a set of figures that wholly corroborates Sleipner's claims. It creates a degree of stability that enables us to move around the boat, from the flybridge to the lower deck cabins with an enviable degree of comfort and confidence.

ABOVE: The cut-out at the base of the fin radically reduces lateral resistance without compromising the upward stabilising force

VERDICT

Sleipner's voracious appetite for incremental improvement, allied to its patience in bringing products to market, has ensured its new electrically powered fins are as effective as they are refined. Of course, after ten years of research, four years of development and two and a half years of live testing, this is by no means the cheapest fin-based solution you can buy – and given Sleipner's unwavering commitment to quality over cost, it was never likely to be. As with any stabilisation system, there are also limits to its effectiveness when sitting still in short or excessively large seas.

But Sleipner's vector fin system is certainly lighter and less expensive than most gyroscopic or hydraulic solutions. And while each boat installation will require some fine-tuning, these fins are not at all fussy about placement or size of boat. On the contrary, with six fin sizes planned, from 0.55 to 2.2m², Sleipner's electric Vector Fins can be applied to all kinds of boat, from 45ft family cruisers to 150ft superyachts. So if you own a suitable boat and you spend long spells on the flybridge, at anchor or overnighting, an electric vector fin system can make such a seismic difference that it seems like a false economy to soldier on without it.