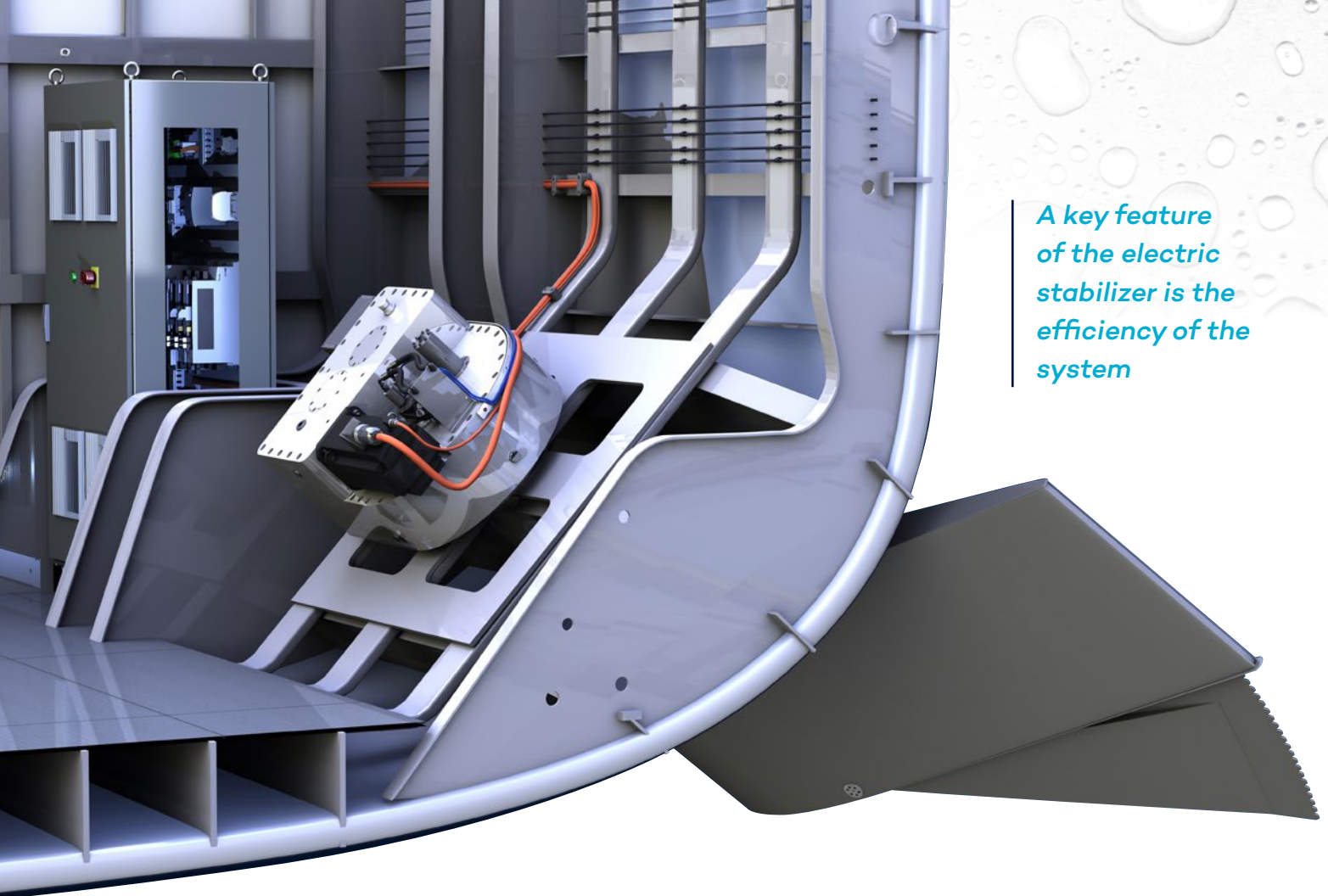




NEW
ELECTRIC STABILIZERS
WITH ENERGY RECOVERY

IT HAS TO BE

Quantum
MARINE STABILIZERS



*A key feature
of the electric
stabilizer is the
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system*

Quantum's Journey into the Electric Fin Market

2012 – First R & D Study on Electric Fins

Quantum's pursuit of developing an electric fin system began back in 2012, with a comprehensive, R & D project that was conducted at Quantum Controls in The Netherlands. There were some key design elements that created challenges such as noise, the power storage system and a reduction gearbox that could withstand both the extreme marine environment and dynamic forces generated underwater. The results of the study, at that time, were less than favorable. In 2014 the project was terminated, and while there were clearly lessons learned, there was a renewed focus on enhancing the capabilities of Quantum's existing product line.

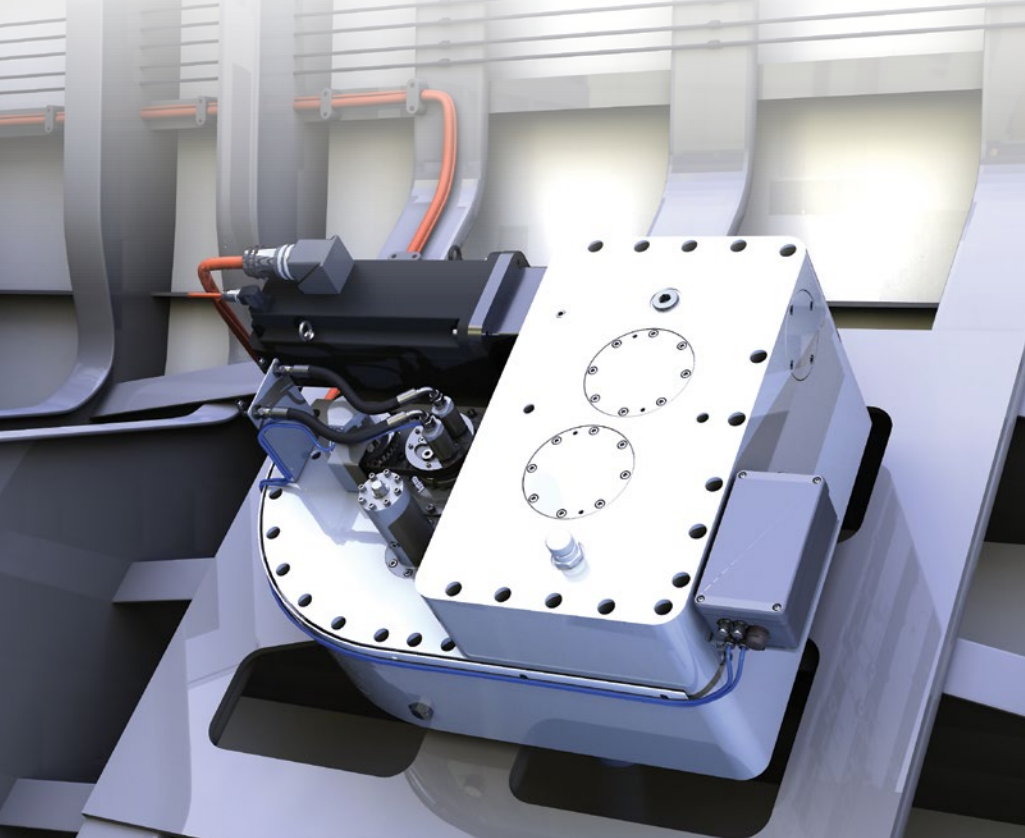
EXCEPTIONAL RESULTS

2023 – Second R & D Study on Electric Fins

In 2023, Quantum made the decision to revisit the electric fin platform to determine the viability, using today's technology. Due to the improvements of power storage systems, in addition to advancements

FEATURES OVERVIEW

- *Smaller hull unit vs a traditional hydraulic system*
- *More efficient use of energy*
- *Fewer components to install*
- *Quieter than a traditional hydraulic system*
- *Minimal heat dissipation*
- *Power storage through recovery capabilities*
- *Power smoothing*
- *Easy connection to AC or DC Bus up to 750V*
- *Uses electrolytic capacitors with fast charge and discharge rates*



UNIQUE GEARBOX

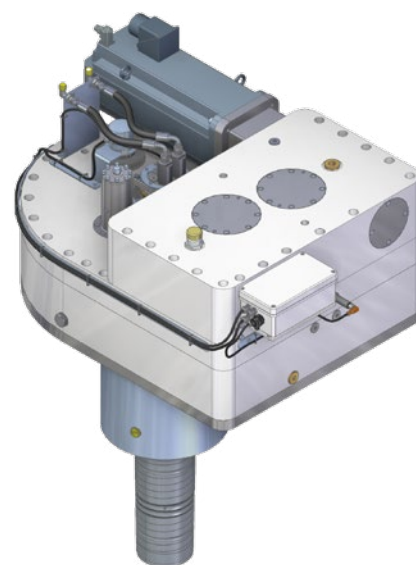
One of the key attributes of the e-FIN System is the newly designed, reduction gearbox. The Quantum Engineering Team fully understands the demands of a stabilizer drive system. Using their depth of knowledge, they were able to develop and design a proprietary, purpose-built, gearbox.

The result: A compact, robust gearbox, capable of handling up to 10 million cycles.

in mechanical and electrical components, the new version of the e-FIN, showed promise.

The latest R&D e-FIN Project, is a collaboration between 15 of Quantum's in-house Hydrodynamics Engineers, Naval Architects, Control Engineers, Electrical Engineers, and Mechanical Engineers from the US and The Netherlands.

The Design Team set out on a mission with one goal in mind, to build the best performing electric stabilizer possible. Using a "clean sheet of paper" approach and avoiding comparisons to the competition, the team was left with zero boundaries and no constraints. The outcome proved to be BRILLIANT!



Fin sizes:

MODEL	Fixed Fin Range	XT™ Fin
e1500	2.5m ² – 3.5m ²	3m ² XT™
e1800	3.5m ² – 5m ²	4m ² XT™

Why Electrolytic Capacitors for Power Storage?

A key feature of the electric stabilizer is the efficiency of the system. Stabilizers use power only when they are moving versus zero power, when they are stationary. This fluctuation causes cyclical loading to the ship's grid, which can be avoided by using Quantum's Energy Storage System.

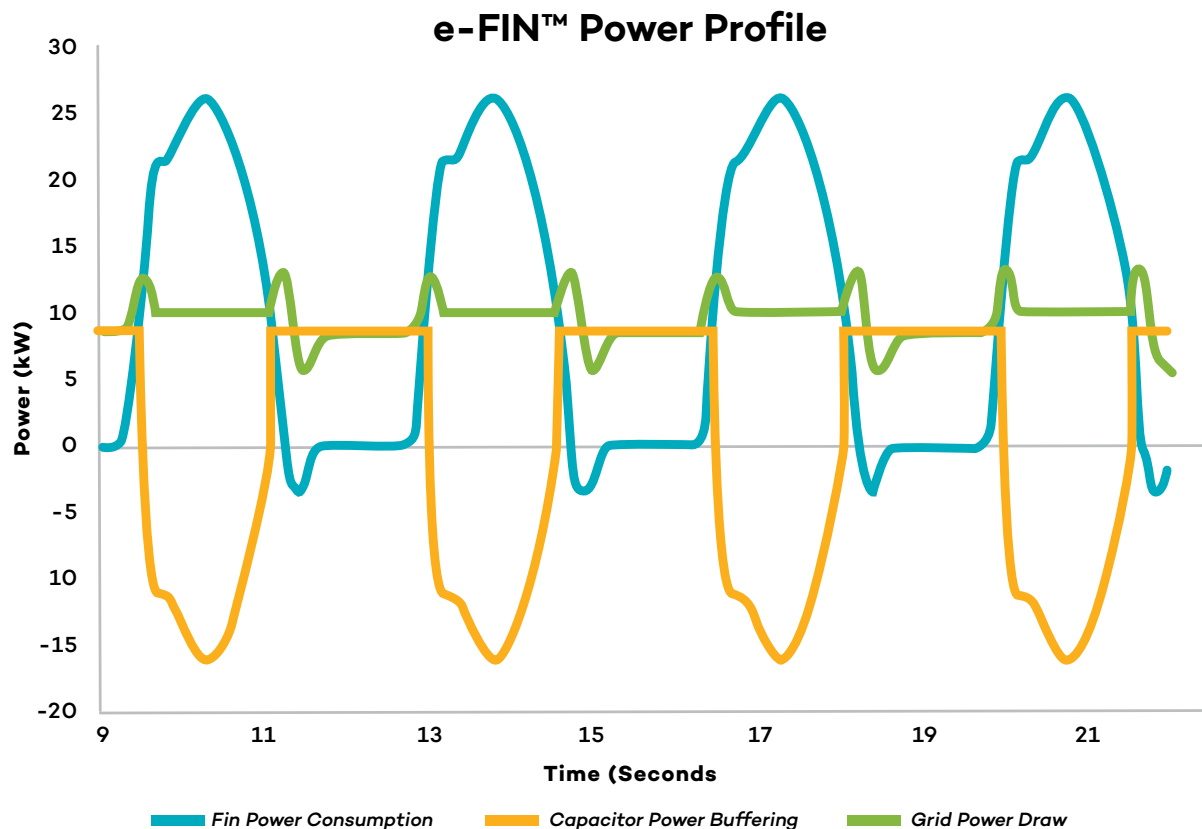


Remarkably, this storage system can be charged when the fin movement is low, and it can discharge energy to the drive motor when fin movement increases. Furthermore, in underway mode, the fins can generate power that can be stored for future use.

Electrolytic capacitors have a long-life expectancy

After a comprehensive study was conducted on capacitor options for the e-FIN, electrolytic capacitors were chosen for the following reasons:

1. High operating temperature – high temperatures can reduce the life of a capacitor, but the electrolytic capacitors were designed to operate up to 45° C (113° F)
2. Longest number of cycles available – controlled limitations on the capacitors, extend the useful life
3. Low degradation over time – minimal deterioration over time
4. Widely accepted for marine use – easy to service



The graph demonstrates the effectiveness of the Electrolytic Capacitors to reduce the overall power draw and minimize the impact on the ship's grid.



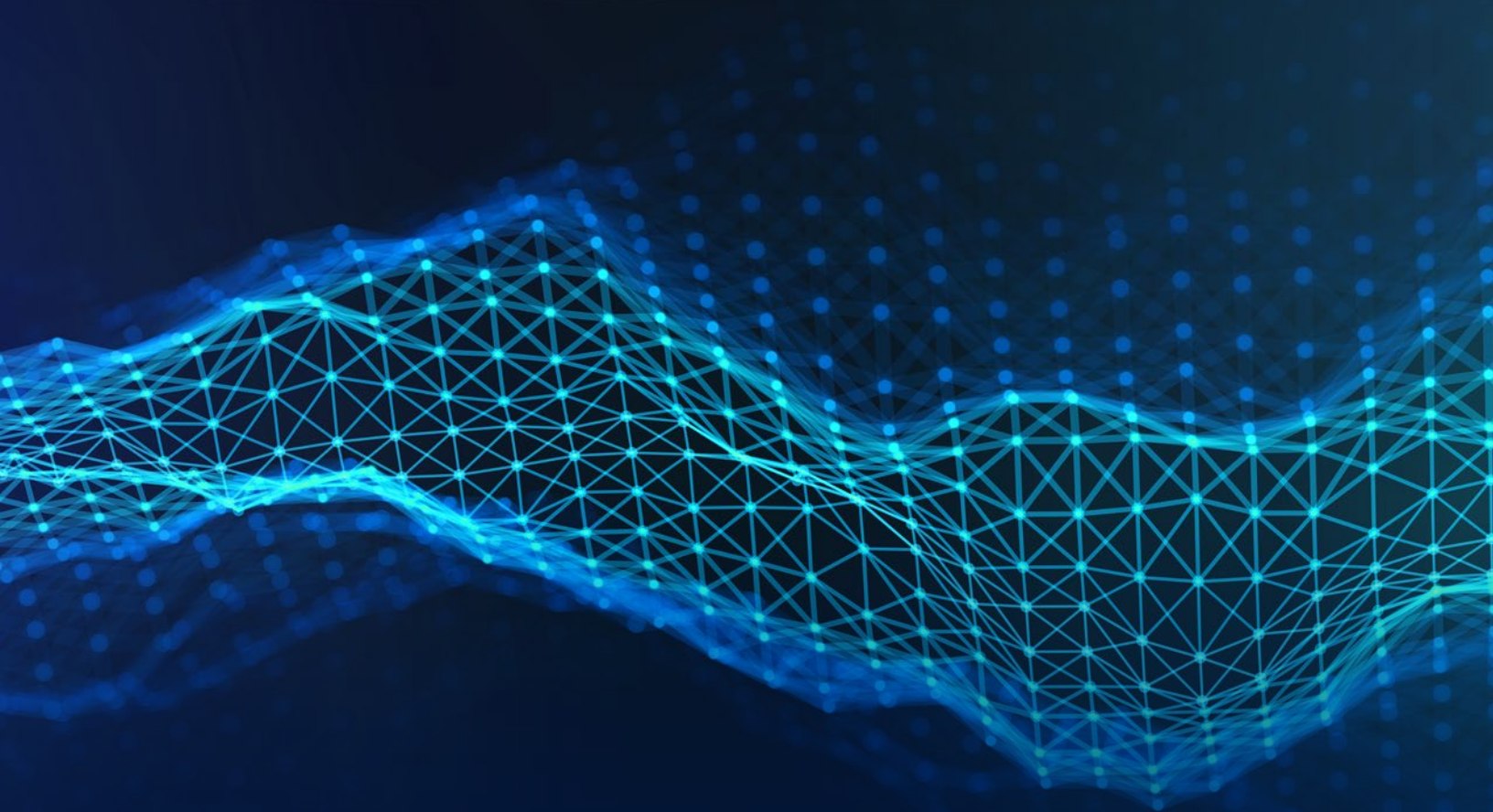
New Touch Screen Interface

The active maintenance algorithm monitors and adjusts the maintenance requirements in real time

The E6 Controller

Quantum's E6 Control, designed for the e-FIN, is similar to the latest 5000S platform, with a touch screen interface and modular programming for independent functionality. Both controls also use the latest system software for superior underway and Zero Speed™ performance.

Another key advantage, the E6 Control has an active maintenance algorithm that is able to monitor torque on the drive motor and make real time adjustments to the maintenance requirements. It also measures the number of cycles and total power consumption for up to five years. Similar to other Quantum control systems, the unit comes with an optional, secured VPN module and can be remotely accessed by Quantum worldwide.



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