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# MEJ

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# Function trumps 'pretty'

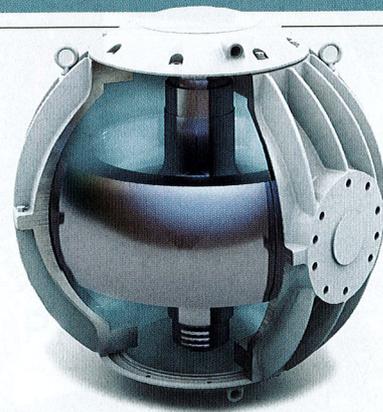
Outfitting a New England  
fishing boat



The Official Journal of the  
National Marine Electronics Association

# Boat rolling a problem?

## 'Smart' gyro and CAN bus to the rescue



**M**aximizing stability at sea has both practical and comfort benefits: it's safer and more pleasant for everyone onboard, whether they're hauling in fishing nets, patrolling heavy seas or drinking champagne on a luxury yacht.

The traditional 'anti-roll' solution is a set of movable fins located externally on both sides of the keel. Whether fixed or retractable, these angled fins generate a corrective hydrodynamic force that opposes the rolling force of the waves. The solution is speed dependent, with specification requiring that fin size is balanced with the projected cruising speed. Other methods are wing-like paravanes or 'flopper stoppers' that hang from outrigger poles to port and starboard and, in effect, anchor the boat in the water column. Paravanes are typically used to reduce or eliminate rolling while underway while flopper stoppers are deployed when stopped.

A relatively new entry on the 'anti-roll' block is Seakeeper's gyro stabilizer, a combined hardware and software system that can be installed virtually anywhere on the boat, because it requires no external equipment outside the hull. A gyro stabilizer works by spinning a flywheel inside an enclosure at high speed—up to 4700 rpm, that's about 550 mph—creating an inertial force forward and aft that counteracts the side-to-side roll. A major selling point is that it will work at any speed, even when the boat is stationary.

"Seakeeper's vacuum encapsulation enables the flywheel to spin roughly three times faster, cuts flywheel weight by two-

thirds and halves power requirements," according to the company.

Seakeeper has developed a particularly sophisticated anti-roll gyro that eliminates up to 95% of boat roll on vessels 27 feet and up. A unique feature is that vacuum-sealed enclosure, which protects the gyro's flywheel, bearings and motor from the marine environment and facilitates a smaller, lighter and less power-consuming design. Seakeeper's solution uses a CAN bus to coordinate a distributed control system.

CAN has been the mechanism by which a host of electronic devices connect to each other via a central, high-reliability backbone to control complex electro-mechanical systems. The addition of a Seakeeper to the list of marine control systems that use CAN is welcome news to boaters looking for a smoother ride.

### Sensing sea state and boat speed

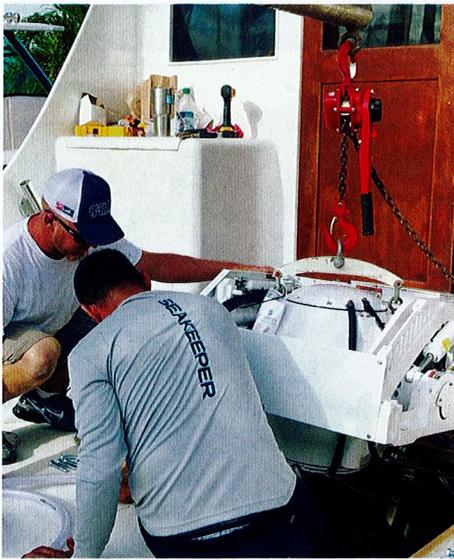
Among the attributes that set Seakeeper's gyro apart from competitor solutions is its

'smart' nature, whereby it automatically gauges variables including sea state and boat speed, then optimizes performance quasi-instantaneously. Explaining CAN's role in the Seakeeper control system, Bob Lawrie, Director of Advanced Projects at Seakeeper Inc., says: "We use the CAN bus to coordinate various sensor readings and actuator outputs to optimize stabilization. Our CAN network has a system controller, an IMU (which senses boat motion), a drive (which powers the motor that spins the flywheel), and a user interface display. We also have a second, electrically isolated CAN bus located in the user interface display that allows replication of the user interface functions on larger display screens."

During control system development and testing, Seakeeper used a combination of the Kvaser Leaf Light Rugged and Kvaser USBcan Light 2xHS to connect to their calibration tools. "As a calibration tool interface, these provide access to all data needed to monitor



*At the heart of a Seakeeper stabilization system is the vacuum-sealed gyro that spins up to 4700 rpm (top photo). This creates an inertial force forward and aft that counteracts the side-to-side roll. The self-contained stabilization package can be installed just about anywhere on a new boat or retrofitted aboard an existing vessel.*



to proprietary software during our final assembly test qualifications and to program the controllers on the CAN bus during production and for software updates in the field.”

Sea trials are a key part of Seakeeper’s test procedures, enabling Kvaser to provide high levels of value-added to the firm’s validation processes. According to Lawrie: “We started using Kvaser because they are compatible with the calibration tools that we use for software programming and testing. From there, we found they were useful, rugged and cost effective to use in our production process and during our extensive testing programs. Kvaser’s interfaces have proved to be rugged and reliable in harsh environments, where there is regular exposure to salt water, high shock loads and temperature extremes.” Seakeeper also uses Kvaser’s free CANKing software for traffic analysis and sending messages during development.

**Tailored for recreational and commercial vessels**

Seakeeper caters to vessels from 7 tons up to 100 tons (the size of a small cargo ship or tug boat). Larger vessels can be fitted with

multiple units to achieve optimal results. While the system’s sophistication may result in a higher initial investment cost compared to a traditional fin stabilizer, the benefits include increased stabilization at zero speed and reduced drag, which improve top speed, fuel consumption and range. The upkeep costs of a gyro are potentially also lower than an external fin as there’s no risk of snagging on marine detritus or seaweed, or damage from grounding when operating in shallow waters.

Seakeepers are regularly installed aboard new vessels as well as retrofitted on older boats. In fact, more than 25% of the systems sold are retrofits, some 1,000 in all to date. Typical installations take about two days.

Seakeeper makes systems for both recreational and commercial vessels. The recreational line starts with a unit designed for 27-32 foot boats priced at \$22,700 and tops out with a system for boats 85 feet and over for \$216,300. Commercial units start at \$45,900 for 35-41 foot vessels and work their way up to \$216,300 for boats 75 feet and larger. Prices do not include installation. **MEJ**

*Installation usually takes a couple of days. Kvaser’s contributions include providing access to data, adjusting calibration parameters, optimizing the control system and logging data to proprietary software during final assembly test qualifications.*

and log data, adjust calibration parameters and optimize the control system,” says Lawrie. “We also use the Kvaser interfaces to log data

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