Calming the seas with CAN

For non-boating experts, it may be a surprise to learn that boats don't have to make that seasickness-inducing roll anymore. A CAN-controlled gyroscope is proving a highly effective solution.

(Photo: Seakeeper)

Maximizing stability has both practical and comfort benefits: it's safer and more pleasant for all onboard, whether you happen to be 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 that sit externally at either side 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.

A relatively new kid on the block is Seakeeper's gyro stabilizer. It is a computer controlled gyroscope that eliminates most boat roll, including the fatigue, anxiety, and seasickness that go with it. The calm-inducing combined hardware and software system 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, 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 has developed a particularly sophisticated anti-roll gyro that eliminates up to 95 % of boat roll on vessels 8 meters and up. A unique feature is its 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. This solution uses the CAN network to coordinate a distributed control system.

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 ▷

About Kvaser's Leaf Light Rugged and USBcan Light 2xHS

The Kvaser Leaf Light R v2 is the rugged version of the Leaf Light v2 interface. This is a single channel CAN interface with a lightweight yet highly durable, IP65-rated housing that assures protection against water and dust ingress. Vibration, shock, and drop proof, this interface belongs to Kvaser's Rugged range and operates over a temperature range of -40 °C to +70 °C.

With a standard USB 2.0 connection and a high-speed CAN channel in a 9-pin D-SUB CAN connector, it handles transmission and reception of standard and extended CAN messages, with a time stamp precision of 100 microseconds. Features include error frame detection and LED indicators for power and CAN channel status.

The Kvaser USBcan Light 2xHS connects two high speed CAN networks to a PC or mobile computer. With a USB 2.0 compliant connector at one end and two CAN 9-pin D-SUB connectors at the other, it is a fraction larger than the one-channel Leaf Light v2. It still features the same sleek, designed housing that Kvaser products have become renowned for and comes with galvanic isolation as standard though.

This device is designed to facilitate any application in which the CAN connectors aren't easily accessible, such as hard to reach electronic control units (ECU) on a vehicle. It is fully compatible with J1939, CANopen, NMEA 2000, and Devicenet.

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control system, Bob Lawrie, Director of Advanced Projects at the company: "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. Recounts Lawrie: "As a calibration tool interface, these provide access to all data needed to monitor and log data, adjust calibration parameters, and optimize the control system. We also use the Kvaser interfaces to log data to proprietary software during our final assembly test qualifications and to program the controllers on the CAN

Figure 1: Seakeeper's gyro stabilizer (Photo: Seakeeper)

Figure 2: Kvaser's Leaf Light in action (Photo: Seakeeper)

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 add 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.

Seakeeper caters to vessels from 7 t up to 100 t (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 improves 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. CAN has been the mechanism by which a host of electronic devices connect to each other via a central backbone to control complex electro-mechanical systems. ◀

CAN Newsletter Online: Kvaser

Interface board

Classical CAN, CAN FD, or LIN

Kvaser has released the Kvaser Hybrid Pro 2xCAN/LIN. It is a dual-channel interface that allows automotive engineers to configure either channel as Classical CAN, CAN FD, or LIN.

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CAN data-logger

Used to develop a student racing car

Tongji Dian Racing from Tongji University performed well in last year's Formula Student China ranking 4th. Kvaser's CAN/CAN FD data-logger was part of it.

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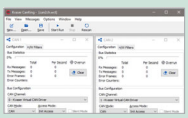

Software release

Python and continued updates to formatters

Kvaser's latest software release includes yet more improvements to it's Python resources. Additionally it adds a new J1939 formatter in the Canking version 6.7.

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Cooperation

Interested in CAN and LIN interfaces

Kvaser (Sweden) has announced that Pertech Embedded Solutions (Israel) has joined Kvaser's sales representative network. Especially the CAN- and LIN-based products seem of interest.

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