

Beckhoff embedded controllers set sail

# Twizzle, the fully automated sailing yacht

The prestigious sailing yacht Twizzle was launched by the Royal Huisman Dutch shipyard in summer 2010. Built by a yard that specializes in custom yachts, this boat sets new quality standards in terms of sustainability, safety and comfort. Though a traditional company in some ways, Royal Huisman equips its yachts with the very latest control and network technology and opted for a PC-based control platform from Beckhoff when building the advanced Twizzle.

When it comes to the application of networks and automation technology onboard superyachts, the Royal Huisman yard based in Vollenhove in the Netherlands can point to considerable successes. In 1998 the yard built the luxury yacht Hyperion for Jim Clark, the owner of Netscape Communications Corporation, a sailing yacht exclusively equipped with the most advanced computer technology. Since then all the yachts leaving the Vollenhove yard are equipped with a modern network into which all the technical functions are integrated, including the cabin automation and media control systems. With Twizzle, the latest yacht to be completed, Royal Huisman takes a step further towards technical perfection: control components from Beckhoff operate every single one of the 3,500 sensors and actuators on the 57 m (187-ft) boat.

## All requirements for reliability, flexibility and transparency fulfilled

Sjoerd Schrichte, Manager of the Systems Integration Department at Royal Huisman, was directly involved in developing Twizzle's automation system and gives the following reasons for choosing Beckhoff as the control system supplier: "We have been automating our yachts since 1995. In the early days of the yard we used Beckhoff control systems increasingly alongside PLC hardware. Twizzle is the first project in which we have used only Beckhoff components for the entire control system. One of the reasons for our decision was the flexibility of these components. For example, the modular design of the existing Bus Terminal stations makes them easy for us to extend if necessary. Moreover, the fine granularity and compact structure of the Bus Terminals, with up to 16 channels in a 12 mm housing, make them extremely flexible and reduce the amount of space they require in the control cabinet. Another advantage is that our engineers find them extraordinarily easy to program using TwinCAT software. All the Embedded PCs can be accessed via Ethernet. Also the transparency of the Beckhoff platform allows us to couple EIB modules, for example, and it even has an interface to the Crestron automation system for yachts, which includes the lighting, air-conditioning and multimedia control systems."

## Even yachts have budgets to adhere to

"Of course cost is a factor," concedes Sjoerd Schrichte. "Even in the high-end sector, you have to think of your budget. We are operating in a highly competitive market where we have to stand out from the rest. One of the ways we have managed to keep within the limits of our budget is by using Beckhoff control technology. Furthermore, the computing power of the Beckhoff CX9000 embedded controllers we are using also gives us a competitive advantage in terms of performance."

## Embedded PCs pass tests in rough seas

Another important reason why Royal Huisman opted for the Embedded PCs was their reliability. This was obvious immediately after the launch when staff from Huisman sailed Twizzle over to Terschelling to conduct some test sails in the North Sea. "On these test sails we put every inch of the boat to the test, including the onboard Embedded PCs, needless to say. Even though it was quite rough out there in the North Sea at times, the onboard control systems functioned perfectly without the slightest hitch," emphasizes Sjoerd Schrichte.

## Meeting the highest environmental standards

Sustainability and a minimum carbon footprint are a top priority with regards to Twizzle's construction and operation. Accordingly, wastewater is not discharged into the sea, a prerequisite for her certification by the Yacht Carbon Offset committee. Exhaust gases from the generators are cleaned by filters developed by Royal Huisman. The remaining CO<sub>2</sub> emissions are offset by what are known as Green Energy Projects all over the world. The same standards apply to the other building materials used such as aluminum and steel. Yacht Carbon Offset monitors whether this offsetting is actually effective. This certification means Twizzle meets the very highest environmental standards and can sail all the world's oceans, including the Arctic Ocean.





The high-tech yacht Twizzle on one of her first voyages on the high seas. The two-master has a total length of 57.49 m and three decks. Embedded controllers and Bus Terminals from Beckhoff control 3,500 sensors and actuators altogether.

### The finest technology for seafaring automation

Beckhoff technology automates nearly all the systems associated with sailing the yacht and life on board. This applies both to cruising under engine power or with sails. "For example, we have an automated engine management system for the diesel engine and its fuel and coolant pumps," explains Sjoerd Schrichte. In addition, Twizzle has a comprehensive hydraulic system that controls the drive for the winches, setting the sails, adjusting the masts, raising the keel, and the swimming platform. In addition, there is of course a power management system onboard which ensures a constant supply of 24 V, 230 V and 400 V. Then there is the yacht itself, which has its own system for producing drinking water, a wastewater treatment system, ventilation system, and naturally a heating and air-conditioning system for all the cabins on board. An extensive lighting system is also integrated into the automation system.

The deck of the sailing yacht Twizzle, built by Royal Huisman of Vollenhove in the Netherlands



Twizzle is a two-master yacht with a fly bridge, i.e. a bridge steering station, fitted on the superstructure to ensure the best possible vision. The total length of the boat is 57.49 m. The draft is between 3.80 m and 10.8 m (board down). The width is 11.59 m. The ship is made of aluminum and has three decks. Both masts are made of carbon fibers; the main mast has a moveable lookout post (crow's nest). The main mast is 62 m high, the mizzen mast 55 m above sea level. Twizzle has an upwind sail area of 2,800 m<sup>2</sup>; close to the wind, her sail area is 2,000 m<sup>2</sup>. Under engine power the yacht reaches a speed of 15 knots. She can carry 44 t of fuel and weighs 550 t. Twizzle was designed by Dubois Naval Architects Ltd. The interior and exterior were styled by Redman Whiteley Dixon Ltd (RWD) and Todhunter Earle Associates.

"Another special feature is the feedback of the rudder pressure," adds Sjoerd Schrichte. "Because the rudder is powered by the hydraulic system, you do not feel any resistance when you turn the wheel. However, so that the helmsman can experience the genuine feel of a rudder, we have fitted strain sensors to the rudder shaft which measure the pressure exerted on the rudder. The measurements are fed into the EPC (Electronic Power Control); this operates a servo-assisted wheel which then puts pressure on the wheel. These are just some of the technical features of this yacht, but the list is still far from complete."

### "The most extensive network we have ever installed on a ship"

A total of 24 Beckhoff CX9000 Embedded PCs are connected to a redundant Ethernet ring structure in order to ensure all the functions can be monitored and reliably controlled. The Bus Terminals control 3,500 I/Os, of which 2,900 are digital and 600 analog. Connections to a higher network level are operated via switches. "This is the most extensive network we have ever installed on a ship," declares Sjoerd Schrichte. The network on Twizzle is connected via standard Ethernet to which the Beckhoff PC and all the other network components are coupled. The PCs communicate via the real-time Ethernet protocol.

Royal Huisman [www.royalhuisman.com](http://www.royalhuisman.com)  
[www.twizzle.org](http://www.twizzle.org)  
 Industrial Automation Link [www.ial.nl](http://www.ial.nl)