

Flawless DeviceNet-based SCADA solution yields 100% profitability from 100% reliable deep-sea fishing application

A Rockwell Automation solution helps ensure zero downtime – valued at US\$15,000 per day – and prevented a US\$170,000 engine overhaul.

Background

Established in 1960, fishing operator Simunovich Fisheries operates the largest privately owned fishing fleet in New Zealand, and is a key supplier of fresh fish to the important Japanese markets.

Simunovich acquired the 61-meter *Ocean Breeze* in 1998 as a wreck, after a fire on-board left it in need of a major retrofit. The fire occurred due to seawater making its way into the exhaust system of its V16 diesel engine. It quickly spread through the engine room and across the vessel's rear deck area, destroying all in its wake, including US\$430,000 worth of nylon fishing nets. At a cost of US\$3.9 million, the fit-out took over nine months to complete. Simunovich was keen to prevent such an event in the future.

Deep-sea fishing operations demand an entirely new level of reliability. Vessels such as those run by Simunovich Fisheries operate many thousands of kilometres from land for weeks and months on end, staffed by on-board engineering crews with limited electrical knowledge.

The crew's prime objective is to protect the quality of the catch on-board. With millions of dollars worth of stock in the



hold, sound operation of systems such as refrigeration compressors are absolutely vital to ensuring the product reaches its destination in perfect condition.

Minimizing operational downtime is also an imperative. In the case of the *Ocean Breeze*, its hold accommodates 800 tons – at a fill cycle period of around three weeks and gets prices of between US\$1,300 to US\$390 per ton, the cost of down-time can run as high as US\$15,000 per day. Vessels such as this simply can't stop.

Challenge

Keen to guarantee that such a disaster was avoided in the future, Simunovich Fisheries' electrical engineer John Wright sought to incorporate a monitoring / alarm solution in the *Ocean Breeze*'s rebuilt

electrical systems. The challenge was to develop an appropriately 'sea worthy' information collection and distributed human machine interface (HMI) system – an on board SCADA system.

Cabling on-board any boat is far more expensive and difficult than land-based hardwired systems. Hundreds of hardwired points routed to multiple monitoring locations on board the *Ocean Breeze* would inevitably prove impractical – and expensive.

Electrical systems on-board an ocean-going fishing boat face a number of 'other' challenges. According to marine electrician Fred Hansford, ship electrical systems really take a pounding. "If you want to test

something in a harsh environment,” Hansford says, “try it on a fishing boat!” These include coarsely regulated generator and battery-based power supplies, humidity and the relentless vibration and impact forces experienced on a vessel sailing in a high swell.

Solution

Conventional marine engineering would have seen a traditional hardwired digital alarm annunciator system applied. Wright could see this approach had limitations. “Annunciators occupy a lot of space, can only be monitored in one location and don’t monitor analog values,” he says. “To assess exhaust temperature, you’ve got to monitor the absolute analog value.”

Wright also felt the points should be monitored in more than one location on the boat, not just the wheelhouse, and that a number of data points – both analog and digital – should be brought back from the engine room, refrigeration systems, fire alarms and so on.

Working with Fred Hansford of FHE Electrical, Wright developed an innovative distributed I/O network to support the shipboard information system he envisaged. A network of eight Allen-Bradley Flex I/O chassis are located about the vessel, providing local connection points for analog I/O associated with the ship’s systems. The Flex I/O chassis form nodes on a bow-to-stern DeviceNet serial network backbone, which is in turn connected to a main Allen-Bradley SLC-500 controller, located in the control room.

The *Ocean Breeze*’s DeviceNet information backbone was realized using

the Allen-Bradley KwikLink connection system, which provides a simple, modular implementation of a DeviceNet system using flat four-wire cable and insulation displacement connectors (IDCs).

System data on-board the *Ocean Breeze* is displayed on a distributed HMI system comprising four separate Allen-Bradley PanelView graphic operator interfaces – one each in the ship’s wheelhouse, control room, engineer’s cabin and assistant’s cabin. The fully-configurable screens provide a complete ‘view’ of the boat’s systems at each location, with screens automatically changing over to the display with the highest priority alarm.

Results

More than a year after the retrofit was completed, the *Ocean Breeze* has not missed an operational beat. Its on-board SCADA system has kept the crew informed, and ensured the vessel has maintained down time to a minimum. “The system has provided 100% reliability,” Wright says. “This equates to 100% fishing time availability, ensuring 100% potential profit is realized.”

The system has also helped prevent at least one major overhaul. “We noticed exhaust temperatures on the main engine higher than they should have been,” Wright explains. “Some had their doubts, but we checked them against the hand-held thermometer. The SCADA was correct – we’d been running overloaded.” Swift corrective action prolonged the life of the engine, and prevented what might have been a US\$172,000 engine overhaul.

The DeviceNet / distributed I/O approach

dramatically minimized and simplified shipboard cabling. The CAN-based DeviceNet link permits the connection of around 100 analog and 300 digital I/O, saving many thousands of dollars in point-to-point I/O cabling and hardware. These points are associated with the ship’s main engine, generator, refrigeration, power, fuel, water and alarm systems. The IDC cabling system provided a drastic reduction in labor and materials, and permits new nodes to be added and removed from the *Ocean Breeze*’s DeviceNet network quickly and easily without cutting the backbone.

DeviceNet permits diagnostic information from intelligent devices – such as a failed input module – to be quickly relayed out to the multi-drop PanelView network. The result is fast dissemination of vital operations information right across the *Ocean Breeze*.

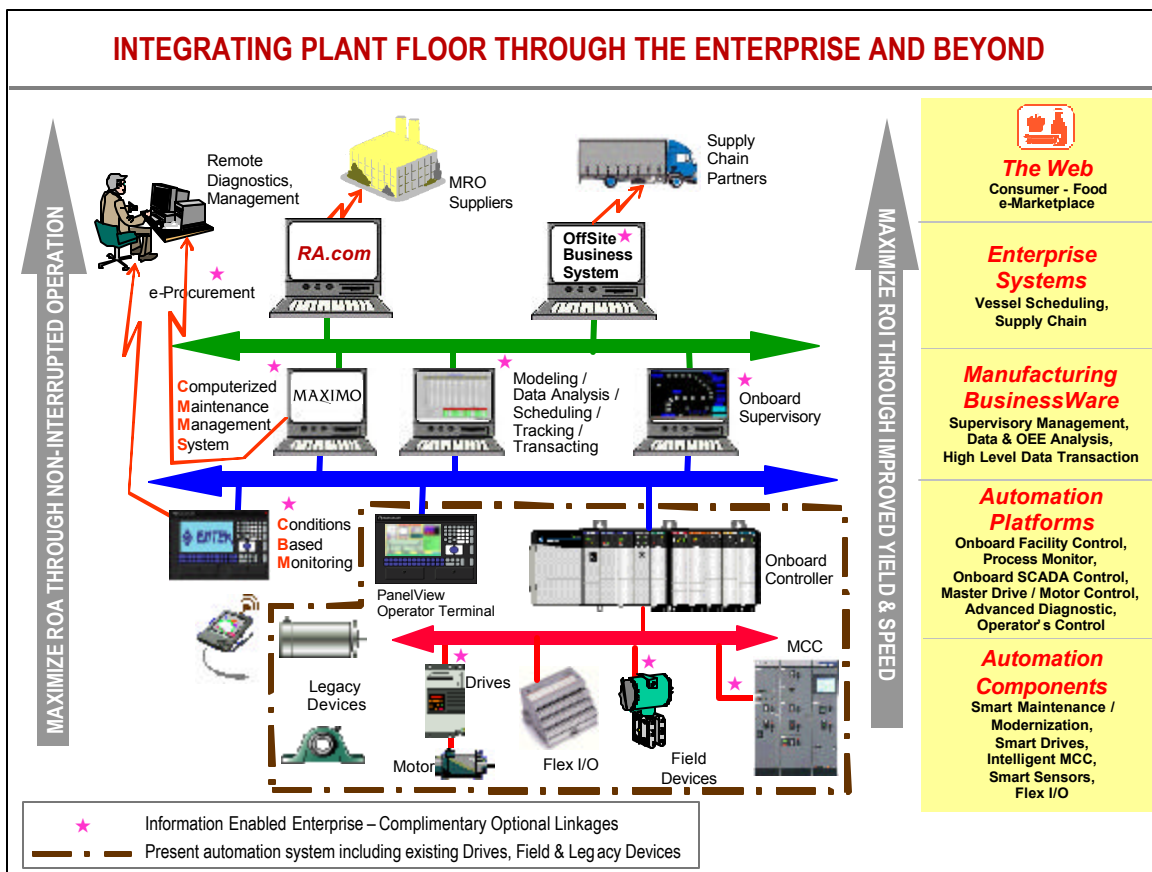
Powerful SLC controller algorithms permit often-complex analysis of the on-board data. For example, the SLC compares each of the vessel’s eight exhaust temperatures against a calculated average. “This approach actually allows us to monitor what’s happening inside the engine!” Wright explains.

The PanelView HMI / distributed I/O system provides Simunovich with an almost limitless capacity to expand and develop the SCADA and HMI system. This is an important value, as on-board information needs can change from week to week. Sharing information is also simple and straightforward.

The *Ocean Breeze* fit-out provides an indicator of the future for the entire Simunovich fleet – condition-based maintenance. “Maintenance management is a big issue here, and it’s been traditionally based on periodic overhauling and breakdown maintenance,” he says. “Periodic maintenance on its own is ancient history now – condition based maintenance and inventory

management is the way of the future.” The information system on-board the *Ocean Breeze* provides the all-important foundation for such maintenance schemes. A rich and growing database of system conditions will provide the ideal basis for predicting the future, ensuring the *Ocean Breeze* will be a rare sight at its Auckland base—remaining out at sea, ‘gone fishin’!

The architecture below depicts Rockwell Automation’s concept of an Information Enabled Enterprise. The area outlined with a brown dash line represents the present automation level in the facility under discussion in this document. The remaining portion illustrates a host of solutions that Rockwell Automation can provide today to integrate the plant floor to the enterprise and beyond.



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