SIEMENS

Case Study

U.S. Air Force takes delivery of first PROFINET Motor Control Centers

Engineers at Electric Power Systems specify use of PROFINET for improved reliability and management of power plant at remote air station.

When you operate a power plant in a harsh environment – like, say, the Western tip of the Aleutian Islands off the coast of Alaska – you go to some lengths to ensure reliability is built in. That's one reason that Electric Power Systems, Inc. (EPS) chose to go with Siemens PROFINET Industrial Ethernet technology for an installation at a U.S. Air Force base in Shemya, Alaska, an island in the Bering Sea.

Eareckson Air Station is in the process of swapping out the generators that supply all power to the base for updated models. In the process, it is also upgrading the power plant infrastructure, including the motor control centers (MCCs).

EPS, the consulting engineer for the project, specified in its request for proposals that the new MCCs must support PROFINET and selected the Siemens tiastar Motor Control Center. Inside the tiastar MCC is the Siemens SIMOCODE modular control system, which comes with an integrated two-port switch that enables the MCC to connect to a PROFINET network.

"For the last couple of years we've been waiting for a project where we could use PROFINET. For this project I needed to network motor control centers. PROFINET does that," says Joe Baack, senior controls engineer with EPS, which is based in Anchorage, Alaska. "It saves a lot on wiring and labor costs for installation."

What's more, it will give the Air Force a network that's far simpler, with Industrial Ethernet connecting virtually all systems. That's a big step forward from the cacophony of hard-wired connections currently in place to connect various control systems to a master controller. The new network will also be at least 5 times faster than traditional field bus networks and much easier to manage, with the ability to tap into most components from a Web browser – no special hardware or software required.

Remote to say the least
Shemya is a 2-mile by 4-mile island located some 1,500 miles southwest of Anchorage, putting it far closer to Russia and Japan than even mainland Alaska. Its only inhabitant is Eareckson Air Station, which is a strategic refueling stop for military aircraft and home to a radar installation.

Six diesel generators that are past their life expectancy currently supply all power to the base. Over the course of about 18 months, the Air Force will replace them one at a time with four larger models – without ever taking the power plant offline. Construction is scheduled to begin in late 2013.

To control the plant, EPS will install the GE PACSystems RX3i controller system. It will communicate via PROFINET to seven Siemens tiastar MCCs. Each MCC houses a collection of controllers that automate the operation of various cooling pumps, radiator fans, fuel pumps and the like throughout the plant. The MCCs also house the Siemens SIMOCODE control system, which supplies a PROFINET connection.

In previous MCC installations, EPS would hard-wire each individual control unit inside the MCC to the master controller, which often meant running hundreds of wires from each MCC.

"Now it's a single network connection for the entire MCC," Baack says. That, naturally, makes installation far easier but it also makes the entire system more reliable, since each of those individual wires represents a potential point of failure. PROFINET, on the other hand, can be engineered to be fully redundant, such that there's always a path around any network failure.

What's more, like many other Siemens PROFINET offerings, the SIMOCODE devices come with a built-in Web server that administrators can tap into to extract all kinds of operational data, including for troubleshooting. And given the network is all Ethernet, an administrator with a Web browser and proper authorization can connect from anywhere, enter the IP address of the SIMOCODE device and immediately tap in to manage the MCC.

PROFINET also supports typical Ethernet speeds of 10/100M bps, whereas the fastest field bus network – PROFIBUS – tops out at 2M bps. That increased speed is important in industrial applications. "The quicker your network is, the faster you can get real-time information," Baack says.

PROFINET passes the test
EPS can be confident that installation in the field will be smooth because it has already conducted acceptance testing of the network configuration at a Siemens facility in West Chicago, IL. The testing was completed just a few months after Siemens was awarded the MCC contract.

Siemens first learned of the opportunity in April 2013. It came with a stringent delivery date because the equipment had to be on a barge destined for Shemya in early June. That left little time for Siemens to build the customized MCC units but it managed to ship the units to West Chicago in May, in time for the acceptance test, which Baack suggested.

"I come from a pipeline background," he says. "I like to do a factory test to eliminate headaches out in the field." That's sound strategy, especially when "the field" is in the middle of the Bering Sea.

EPS allotted five days for the acceptance test, which involved setting up the controllers inside each MCC for two main functions: one to control variable frequency drives and another to control motors. The team had to set up some hardware and configure each VFD or motor controller with an IP address, then ensure it could communicate with the PROFINET switch in the MCC and function as expected. From the MCC, the team then configured just a single PROFINET connection to the GE controller.

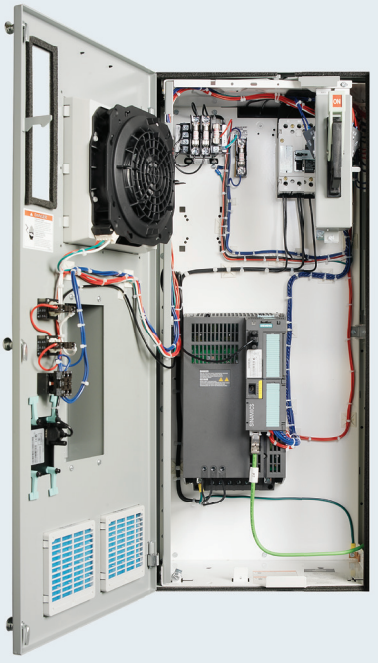
Configuring the first of each VFD or motor controller took maybe 6 to 8 hours, Baack said. The rest went far quicker. In all, the job was done in 2.5 days, half the allotted time.

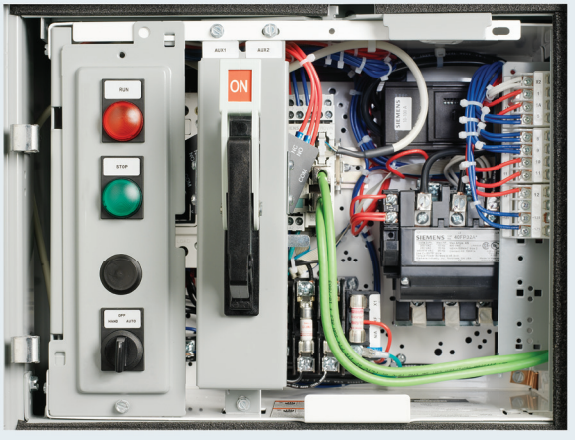
Off to work
In early June the seven MCCs made their date with the barge bound for Shemya, the first shipment of tiastar MCCs outfitted with PROFINET to make their way to the field. They will be installed in waves over the course of 18 months, a job that the acceptance testing will make far easier, says Ryota Abe, an EPS electrical engineer who will be responsible for the installation.

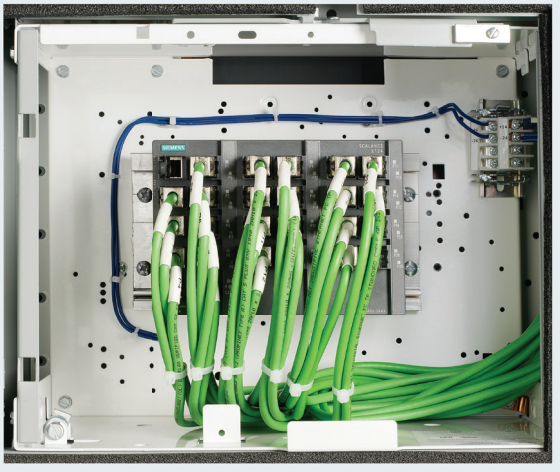
"It's going to save a lot of field time as far as configuration of the controller and of the PLC software," Abe says. "Once we get to the field, it's just a matter of installing it and doing some checks to the pumps and motors wired to the MCCs."

Having PROFINET run throughout the plant rather than a slew of hard-wired connections will bring advantages as well. “With hard wiring you have more possible points of failure or problems as opposed to just one CAT 5 cable coming back to the controller from each MCC. That’s a big advantage,” he says. “And the amount of data we can get out of the [motor] starters and VFDs is a lot more than we’re likely to need, but it’s there if we need to get it.”

“It’s the way the industry is going,” Baack says of PROFINET. “It cuts down on commissioning time quite a bit and gives a lot more information back to us, the control guys, and to the customer, as far as the [integrated] web pages where they can get diagnostics for troubleshooting. It’s definitely going to be better for them.”







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