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Intelligent devices improve remote operations

Case Study

The combination of smart devices working in a unified engineering environment delivers outstanding operational efficiency. Customer and integrator recognize value in remote monitoring and device diagnostics.

When operations are truly remote, sometimes the best solution can be adding remote operation capabilities. Such was the case of a oil drilling barge operator that saw the value possible by adding a higher level of smart device integration to a difficult application.

Drilling for oil and gas often takes operators to remote and hostile locations, and a drilling barge is a very clear example. These vessels operate in shallow waterways and swamps where they can be partially sunk to sit on a muddy river bottom. Finding technicians that want to spend weeks in a Louisiana swamp can be a challenge, so one barge operator looked to Siemens to provide a higher level of automation sophistication to reduce the number of people needed at the site.

The degree of sophistication incorporated into a wide range of devices from controllers and PLCs on down to individual field devices has grown significantly over the last few years. Even individual sensors and basic items like motor control centers (MCCs) have gained new communication capabilities, and sophisticated engineering environments like Siemens' TIA Portal provides ways to use those capabilities effortlessly.

Migrating legacy systems with minimal downtime

Here's an actual drilling barge case study that illustrates the point. Solid State Automation and Controls (SSAC) in Houston, Texas, is a system integrator and certified Siemens Solution Partner that works in a wide variety of industries. Recently the company completed a large project for an oil-drilling service contractor to make major control system upgrades to a drilling barge. This type of barge is used in situations where wells need to be drilled in shallow water, and carries the same kind of equipment as an equivalent land-based operation, but in a smaller space than a typical land rig. These types of barges are typically used in remote locations with small crews.

For this situation, the barge owner brought in SSAC late in the project after the equipment had been specified and purchased, including Siemens smart MCCs based on the SIMOCODE. SIMOCODE is a motor management system. It not only provides solid-state overload protection for a motor, it also has local control, I/O, monitoring and diagnostic capabilities that provide protection for the process. Richard Anderson, senior engineer and co-owner of SSAC, described the challenge: "This was

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an old rig and they were modernizing,” he said. “The challenge was integrating the operations in place with upgraded control systems to increase its overall production efficiencies.

“There was no overall control system and everything was operated through physical controls. Most operations used push buttons while some operations worked from a simple touchscreen. The customer wanted remote support and also the ability to monitor the equipment so they could troubleshoot anything from a central engineering location.”

Adding remote control and troubleshooting

When Anderson and his crew started their work, much of the hardware installation had already been done, including installation of about 75 SIMOCODE devices. SSAC’s job was to do all the programming and integration to make everything work together. The main controllers were Siemens SIMATIC S7-300 controllers with Comfort Panel HMIs, communicating using PROFINET and PROFIBUS, with all configuration and engineering via the TIA Portal.

The barge owner was clear that it wanted all the equipment fully integrated to provide remote support, supervision, troubleshooting and preventive maintenance capabilities. The day rate for a barge of this size is typically around \$50,000 so downtime is very expensive. Providing these critical capabilities requires intelligent devices at every level, since remote operation depends on controllers, sensors, valves and even MCCs sending performance and diagnostic data to a central control location.

The barge has its own diesel generator set capable of powering the entire operation. The largest motors installed on the rig

drive the mud pumps, draw works and top drive. They’re all DC and are controlled using Siemens DCM drives. The ancillary equipment is driven by a variety of motors from fractional to 100 HP. These use SIMOCODE motor management and control devices with the SIMATIC S7-300 controllers. All of the SIMOCODE devices communicate with the controllers using PROFIBUS DP wired in a daisy-chain topology. The engineering support capability that ties everything together is the TIA Portal, providing an efficient means to get all the elements integrated with minimal programming effort through code reuse.

Engineering environment for delivering on time and to spec

As Anderson described, “The owner uses all the system diagnostics, so to make it work, we turn that capability on with the S7-300s and call up the diagnostic screens with the Comfort Panels. All you have to do is put it on the screen, enable system diagnostics from the SIMOCODE and RES (Report System Errors) brings diagnostics up on the system without us having to program anything.”

Getting the variety of devices on a drilling barge to share commands and information often depends on a variety of communication protocols. The SIMATIC S7-300s use PROFINET, PROFIBUS and MODBUS simultaneously to communicate with all the different devices on the rig. In some cases the network selection is driven by the nature of the devices, or it might be based on wiring preferences. The SIMOCODE can communicate using a variety of industrial Ethernet networks like PROFINET, but Anderson and his team use PROFIBUS DP in a number of applications because it supports the daisy-chain wiring topology they wanted.

Operational advantages

Finding enough skilled technicians to support oilfield operations is a challenge in the best situations, but it’s made worse here because of the remote locations where these kinds of barges operate. Consequently, it is not always practical to have individuals trained to troubleshoot and solve electrical problems on the rig at all times. This is why barge owners depend so heavily on centralized engineering departments that can work with technicians deployed on individual rigs. “The customer wanted remote support and also the ability to monitor the equipment so they can troubleshoot it remotely,” Anderson explained. “That’s the beauty of the SIMOCODE system. It’s like having a voltmeter always connected to all those motors. The customer’s engineer could log in remotely and see the information online through the web server in the Comfort Panel HMI.”

In some cases, the ability to view what’s happening with a motor or other system on the barge can prevent problems that Anderson has observed common to less sophisticated controllers. “If a motor is developing problems and drawing more current, some lower-level technicians will go into a dumb starter, take a screwdriver and turn up the current on the overloads to keep it from tripping,” he said. “The beauty of SIMOCODE is that the functionality to make such a change resides in the system. We can provide the ability to adjust the overloads, but protect it with a password so we can be sure people aren’t going into the MCC buckets and messing around with the equipment. Each rig normally has its own electrician, but the supervisor or engineer can login and see what that motor is doing remotely and then discuss with the technician onsite. SIMOCODE doesn’t just tell you that you have a problem

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and the probable cause, in many cases, it can provide an early warning sign of a developing problem before it shuts the system down.”

Intuitive and simple programming

While the capabilities of new systems have expanded, programming has become simpler with creative ways to re-use much of the code, including the TIA Portal advanced library capabilities. In a situation like this where there can be a group of identical motors and starters that need the same parameters, it is a simple matter to move the programming from one to a whole group. That information can be stored in the local controller and also in the TIA Portal. Anderson explained, “We store all the SIMOCODE parameters for a starter in the controller, so if one of them fails, the technician simply replaces it with a new one. Once it’s installed he just has to set it to the right address and it will upload all the current, fault and other parameters that it needs to have.”

The SIMOCODE can also return the favor and help support the SIMATIC controller if there’s a problem. With its high level of built-in functionality, a SIMOCODE can continue operating even if the SIMATIC controller shuts down. With older systems, the PLC held all the intelligence so it became a single point of failure. “There’s a major safety aspect to it all,” Anderson pointed out. “In the old days it was possible to get all the information, or at least most of it, from the starter by moving it through the PLC, and the PLC would do all the controlling if you wrote enough code. Moving more intelligence into the SIMOCODE (equipped motor control center) allows it to function independently of the PLC so if it fails, the SIMOCODE can still do what it needs to.”

A common situation results in increased production capability

The situation faced by SSAC and its customer is the new normal for most companies. Users face a combination of production cost pressures and skilled labor shortages while trying to fulfill strong customer demand. The solution for increased production capabilities can only be a greater dependence on automation

supported by technologies that allow for efficient engineering. Siemens provides a wide range of products to fulfill that requirement, embedding intelligence in devices down to the lowest networking levels. SIMOCODE motor management and control devices that operate within the TIA Portal environment are just one example.



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