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Case Study

Ensign Upgrades Drilling Rig MCCs

With Siemens SIMOCODE Motor Management System

Using data to economically drill faster and safer is nothing new to Ensign Energy Services, one of the world's leading land-based oil and gas drilling businesses. Since the early 2000s, Ensign has optimized rig performance controls with real-time data and advanced analytics.

In April 2019, Ensign continued to build upon its oil and gas digital control leadership when it upgraded two traditional motor control centers (MCCs) on a drilling rig just west of San Angelo, Texas.

Tony DeSalvo, global automation and controls support supervisor, oversaw the upgrade. He says the MCC improvements showcase how Ensign is making technological strides to stay ahead of the pack. "This is a very volatile industry," DeSalvo says. "The price of oil goes up and down every day and we use technology to remain on top."

Based on the success of the project, DeSalvo says he plans to replicate the MCC upgrade in many of the company's legacy 150 rigs worldwide. "This smart motor management technology will help Ensign to continue to connect the world to 7% of its energy needs," says DeSalvo, making comparison to the estimated 2,000 drilling rigs on the planet.

Brains and Speed

The MCC upgrade added yet another dimension to Ensign's Edge Rig Operating System, the brains of the drilling rig. The Edge system's analytics stream rig data 24/7 and utilize machine learning algorithms to pull out data to continuously improve rig, crew, and drilling performances. It controls drilling optimization technologies that seamlessly integrate with all Ensign rig control systems.

The MCC upgrade utilized a time-tested digital motor management system to achieve significant and transparent motor control, analytical and safety improvements, turning the "dumb" MCCs into smart assets. But DeSalvo first explored his options.

Tony DeSalvo, global automation and controls support supervisor, takes readings from a drilling rig motor control center recently upgraded with Siemens SIMOCODE motor management system.

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Adding Siemens SIMOCODE motor management system to Ensign's existing GE motor control center reduced drilling rig controls commissioning time from three days to just one.

"It would have taken an extensive amount of wiring to get 120-volt circuits back to a remote I/O panel to collect as much information as possible from the old MCC buckets," DeSalvo says. "Ordering smart MCCs was also an option, but one that did not meet the almost unrealistic time we had to complete this project. So, we looked at other technology."

Tough timeline indeed. DeSalvo was given just 12 days to commission the project. "We usually have a month," he says.

DeSalvo then evaluated Siemens digital motor management system that showed promise. "I did a lot of research and people laugh when I say I stumbled upon the SIMOCODE motor management system in Siemens online catalog."

Working with Houston-based electrical and automation equipment supplier Current Power and Siemens engineers, DeSalvo quickly discovered he could save $50,000, or 10 percent of the overall upgrade budget, in traditional wiring material and labor costs by installing SIMOCODE on the two MCCs.

"Typically, it is a three-day process to commission a smart MCC lineup on one of our drilling rigs," DeSalvo says. "We had to go to each bucket, get online with its individual interface and put in all the buttons and setpoints." He added that the commissioning team would also function test each bucket and then ensure all the I/O mapping was correct.

"Installing SIMOCODE was seamless with the SIMATIC S7-1500 series controllers connected with PROFINET to the scalable ET 200SP distributed I/O system we use with our Edge system," DeSalvo says. "I/O mapping was already set up and everything was commissioned with the Totally Integrated Automation (TIA) Portal engineering software, eliminating the step to check each individual bucket interface independently. It easily reduced our usual three-day MCC lineup commissioning down to one day. In the end, the motor management system helped us turn the rig over to operations in just 10 days."

DeSalvo adds that the "Commissioning of the system really couldn't have gone any smoother." He says Ensign utilized many of the functions of SIMOCODE both basic and intermediate. He also reached out to Siemens engineering support staff to use more advanced SIMOCODE features, including acyclic send data.

Small Motor Diagnostics Keeps Rig Running

John Franks, Current Power vice president of sales and business development, says the upgrade allowed Ensign to monitor and perform preventive maintenance on the rig's smaller motors. "Other than the large variable frequency drives, there are hundreds of these small motors on a rig," he says.

"Ensign can now capture data and remotely monitor the motors using a centralized PROFINET network," Franks continues. "Before, the small motors were just turned on and off. When there was a problem, it would be rip and replace."

Conversely, if the motors' MCC inputs were hardwired, the only information available to the operators would be via auxiliary contacts to determine if the motors were running, or if a breaker and the MCC were energized.

"The SIMOCODE lineup gives us every piece of information available from that individual motor or process on the rig," DeSalvo says. "It is all fed back to our main controller, but without all the wiring."

DeSalvo used the rig's drawworks auxiliary motors as an example of the enhanced level of data and diagnostics now available to the rig operators. The drawworks is an indispensable workhorse of the rig, used to hoist machinery up and down through the mast. "At any given time, we know that the drawworks auxiliary motors are running, as well as if the currents are balanced and matched across each of the three phases," DeSalvo says. The photo below shows DeSalvo reviewing operational parameters.

If a current imbalance occurs, an alarm on the MCC's HMI is activated, alerting operators of an impending motor or wiring failure. "We can have our maintenance department do preventative work on that motor instead of waiting for it to fail. If it failed, we're done drilling. In this business, every minute we are down we lose revenue."

He adds that in some cases the closest maintenance worker may be three to five hours away from a rig. "On average, a rig drills about $30,000 a day," DeSalvo. "On top of that, there are five workers standing by waiting for this huge piece of equipment to start drilling again. The losses quickly add up."

Safety Enhanced

Safety on an oil rig is always a top priority at Ensign. The SIMOCODE upgrade helps prevent employees from skirting around safety procedures, such as turning up the overload on an open bucket. "SIMOCODE won't let them," DeSalvo says. "It's done through a programming interface, so your typical operator can't just walk right up to it and start manipulating things that could jeopardize safety."

"It's safer than some smart MCCs we've used," DeSalvo. "While the MCCs are still intelligent, an operator can still open a door and adjust an overload up as far as they want to. SIMOCODE doesn't let them do that, and it's really comforting knowing that I'm not going to get a call in the middle of the night."

Additionally, the ET 200SP I/O also allow for even more enhanced protection with safety-related communication via PROFIsafe for future upgrades.

Looking Ahead

While this initial upgrade to the SIMOCODE motor management system included only 18 MCC buckets – a small project for Ensign, according to DeSalvo – he says soon every bucket in the rig's electrical house will be upgraded.

"As we move forward with some of our other types of rigs, including some with close to 100 buckets, I would like to streamline this technology to smart buckets with the SIMOCODE lineup." DeSalvo says. 'Before the upgrade, all we knew was that the motor was running. We didn't even know if the bucket was in auto mode."

The market has been good to Ensign. The company noted a 17-percent revenue increase over 2017 in its 2018 annual report. If all continues to go as well as expected, DeSalvo says the successful upgrade will be replicated, including in

17 similar drilling rigs operating in West Texas. DeSalvo says his plans are to upgrade rigs with its Ensign Edge Rig Operating System and the SIMOCODE lineup – the backbone of the MCC systems going forward.

He says the ability to reap the benefits of smart MCC technology in such a tight timeline and a small budget gives Ensign a competitive edge by reducing revenue loss and increasing preventative maintenance. "We are a world leader because we deliver safe and the most technologically advanced drilling rigs on the market today – that's where we win. We've cut costs, enhanced safety and increased technology through our partnerships with Siemens and Current Power."

"I work closely with our engineering manager, who has also given his stamp of approval on future upgrades," DeSalvo concludes. "Every chance we have, we will definitely upgrade the MCCs with SIMOCODE. It's part of the standardization. It also speaks to the success we've had with the product, and how seamlessly it incorporates with the rest of our operating systems."

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