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CASE STUDY

Top hydraulic fracturing controls provider builds a reputation for rock-solid reliability enabled by Siemens technology

Prime Well Service Instrumentation helps lower E&P well service costs and boost visibility, safety, flexibility, and reliability.
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Horizontal drilling and hydraulic fracturing technologies may have revolutionized U.S. exploration and production (E&P) in the last decade, but they're fraught with financial risks. That's especially true for independent E&P companies, who may be heavily leveraged. Speed is critical, too, because fracked wells are estimated to yield more than half their crude oil and nearly 40 percent of their natural gas in their first two years of production, followed by sharp declines in output thereafter.[1]

- **Company:** Prime Well Service Instrumentation, based north of Houston
- **Challenge:** Optimize customer frac operations at scale; help them cut costs and improve operating visibility
- **Solution:** Standardize on Siemens SIMATIC automation and controls technology, including the TIA Portal
- **Results:** Lower well service costs and more visibility, safety, flexibility, and reliability for customers; faster time-to-market and differentiation for Prime WSI

Such rapid depletion rates mean E&P operators, including the majors, must keep fracking new shale formations to keep cash flowing, debt serviced, and investors aboard. Same goes for oil service companies. It's vital to their shareholders that those pressure-pumping fracking assets remain fully deployed in the U.S. oil fields.

That's also why operational visibility — to optimize rig performance in harsh, often widely variable conditions — plus safety and reliability are all so important. "Time is money, and every minute of downtime is money lost. Often, it's a lot of money," says Blair Thornhill, co-founder and president of Prime Well Service Instrumentation (WSI), based north of Houston.

A subsidiary of Germany's KATT GmbH, the company serves the worldwide market for controls and data acquisition systems for frac and coiled tubing, among other well service equipment that includes frac blenders, hydration units, chemical units, pumps, and datavans. One feature among many that sets the company apart is a three-year "bumper-to-bumper" warranty on all its hardware. It's an assurance of reliability and support that's unheard of in an industry where harsh operating conditions are typical.

1 Vieth, Warren. "Horizontal wells produce majority of lifetime oil, gas in first three years." Oklahoma Watch. July 12, 2017.

Challenge: Optimize customer frac operations at scale; help them cut costs and improve operating visibility

Thornhill is an oilfield veteran who previously built a successful controls company for pressure-pumping equipment that was acquired by a well-known frac-and-coil company in Houston. He knows the cost of disruption and downtime as well as the need to keep fracking operations performance-optimized while reducing upstream operator costs wherever possible.

"Staying up and running is paramount for our customers, but strange things can happen out in the field," he says. "Screens can shatter or get liquids spilled on them, equipment can be dropped, left behind, or run over. But these kinds of adverse events can't be allowed to bring an entire operation to a standstill. Advanced controls and reliability through redundancy are needed to keep fracking operations going."

Hard to scale. According to Thornhill, the pressure pumping equipment used in fracking can be hard to scale because it can involve the orchestration of so many different systems operating at the same time. "You can have upwards of 30 pieces of equipment on one frac job, so you have to have a cohesive control system across all that equipment to seamlessly execute all the different processes happening in the job, all with extreme precision and all in real time," he says.

Those frac control systems are his company's specialty, one his engineers are always looking to improve upon with new innovations. "Pressure-pumping customers who have different control systems with different PLCs and other components can make innovations difficult because an upgrade in one system or its component can have an unforeseen impact on the operational performance of other parts of the system," Thornhill says. "With having control components from different manufacturers, it takes a ton of regression testing to ensure everything works without a hitch. Even then, nothing is guaranteed."

Prime WSI frac controls can also help E&P operators further digitalize their field operations and reduce manual processes. Thornhill points to hydro testing as an example. "One of our customers was doing 400 manual well tests a day, but with our automated system, they could run consistent, repeatable tests taking just seven seconds each without all the fatigue, tedium, and cost of someone doing those manually," he says. "And, of course, there's the safety factor. If anything under the immense pressures associated with pressure pumping blows, it puts people's lives at risk."

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>
> **Blair Thornhill, President,**
> **Prime Well Service Instrumentation**

Solution: Standardize on Siemens SIMATIC automation and controls technology, including the TIA Portal

Thornhill and his engineering team chose Siemens as the company's strategic sole-sourcing partner for the automation and industrial control technologies needed for its line of frac and coiled tubing solutions and other portfolio offerings. For assistance in procurement and engineering, it turned to AWC, an Authorized Siemens Distributor, staffed with Siemens-certified automation and control specialists. "It's hard to beat the combination of Siemens technology, including its interoperability, engineering, and reliability, with the support and service we get from AWC," says Thornhill. "We can rely on both companies to always have our interests at heart. They truly are partners in our success."

The principal Siemens components used in Prime WSI frac controls include the following:

- **SIMATIC S7-1500 PLC,** the most advanced, high-performance Siemens model. It features a fast backplane bus, up to three PROFINET interfaces, and precise, deterministic signaling in microsecond timeframes. Its multiple CPU models — including fail-safe, safety-integrated and security-integrated ones, plus technology modules for specific tasks, and communication modules — give Prime WSI plenty of options to tailor its frac controls for a customer's particular requirements.
- **SIMATIC Comfort Panel HMI displays,** which Prime WSI uses in different sizes, depending on customer requirements, to provide operator control.
- **SITOP Selectivity Protection Modules** are power-supply extensions that enable Prime WSI to distribute the load currents in its frac controls independently across several 24-V DC load circuits, then monitor each circuit for overload and short-circuit conditions.
- **SINEMA Remote Connect,** a centralized management platform for remote networks that facilitates the secure management of VPN connections between the E&P frac operator and wherever the Prime WSI frac controls may be operating. Supported wireless media include cellular, WiFi, WiMAX, and satellite, plus a host of transport protocols, such as PROFINET, industrial Ethernet, and Modbus.

Using the SIMATIC TIA Portal, Prime WSI engineers developed a base set of code that can be customized for customers on a case-by-case basis. This allows the company to stay nimble, able to service a wide variety of E&P oilfield clients. Most setups are largely the same, requiring some customization to suit a customer's specific needs. This means they can reach and work with a client in Siberia, as easily as one in North Dakota or in Texas.

Says Thornhill: "We can count on Siemens technology as being ready to go. Most of our competitors use components from many different manufacturers especially when it comes to PLCs and HMIs. Those competitors are tasked with extensive testing to ensure components work together and are often met with network or compatibility issues.

"With Siemens, we don't have the same concerns because we know everything already works. This allows us to rapidly deploy our solutions. We have a base code and architecture of how we like to lay things out. We try to make the program universal where we can make custom changes on the fly, but it's a familiar fit and finish across the program. We don't have to reinvent our solution every time."

Thornhill cites the SIMATIC TIA Portal as playing a big role in Prime WSI's success. With it, company engineers can program everything in a single environment, making their work that much more reliable, and the turnaround time practically unheard of in the industry. "The TIA Portal saves us weeks of engineering time," he says. "Plus, we can use it to troubleshoot and remedy issues remotely."

SINEMA Remote Connect is how both Prime WSI and customers can monitor the health of its deployed systems to ensure they're running smoothly and performing at their best. If issues arise, the SIMATIC PLC's onboard remote diagnostics can be used to troubleshoot root causes from afar. With the SINEMA Remote Connect client, customers as well as Prime WSI engineers can log into any specific PLC system, and work on it in real time without ever having to get on a plane or even leaving the office.

Results: Lower well service costs and more visibility, safety, flexibility, and reliability for customers; faster time-to-market and differentiation for Prime WSI

Prime WSI's market-disrupting innovations in its frac controls and coil solution can reduce manual operating costs for E&P and oil services customers, while enhancing the digitalization they need to increase their operating visibility and ability to orchestrate the wide range of frac systems at each frac site with precision and confidence. "We're able to deliver the high-performance automation and controls we do by having standardized on Siemens technology, aligning with both them and AWC as strategic partners," says Thornhill.

Prime WSI frac, coil tubing, and other oilfield system solutions, combined with its data acquisition systems and remote connectivity, can enable operators to manage their capital assets as enterprise fleets, optimizing each asset's performance for specific field conditions.

Three-year warranties. The company's solutions enable operators to conduct their well service activities much faster, more flexibly, and with greater reliability. "Between us and our sister company, we have deployed our control systems for over 80 frac fleets worldwide," Thornhill says. "We're the only automation and controls supplier in the pressure-pumping industry to provide a three-year, bumper-to-bumper warranty on all of our products because we know our products simply stand up. That means a lot to our customers because they know how rough oilfield conditions can be. It also sets us apart from our competition. And the only way we can be confident enough in the ruggedness of our gear is knowing we've got Siemens technology inside it all."

Consistent, repeatable test results mean safer, leaner operations, too. "With our hydro-testing solution, for example, operators no longer have to manually conduct the hundreds of tests they might otherwise have had technicians do," Thornhill says. "The tedium alone can lead to manual errors, and the time savings can be substantial."

It's not just the industry-proven reliability of Siemens products that has helped Prime WSI get out ahead of the pack in the pressure-pumping industry, it's also their recognition of the importance of redundancy in systems. "With remote access and automated testing, there is no reason that customer users have to stay on site any longer than they need to," says Thornhill. "They can set up field offices anywhere they wish and enjoy the flexibility of a normal schedule, knowing their frac, coil tubing, and other controls and data acquisition systems are keeping watch over their frac operations, ensuring reliable and safe performance day to day and from site to site."

Legal Manufacturer

Siemens Industry, Inc.
100 Technology Drive
Alpharetta, GA 30005
United States of America

Telephone: 1-800-241-4453
usa.siemens.com