Smart Connected Field Operations: An Oil & Gas Case Study

by Sagar Asalapuram, John Woods and Jordan Reynolds

As the global demand for oil rises, the US shale industry can leverage smart connected operations – enabled by digital technologies – to deliver operational excellence in field operations. The ability to collect, process, analyze and act is an important driver for a very data-intensive upstream business.

The potential value is huge. With smart connected operations, oil and gas companies can rapidly drive insights from massive datasets and automate or simplify many processes and tasks in exploration and production activities.

Here’s an example of how one company partnered with Kalypso to address their challenges with a unique three-phase approach that drives real business results.

The Company and the Business Challenge

A top independent shale operator in the Permian basin has a growth target of 4X barrels of oil equivalent (BOE) in the next 8 years. This requires a transformation in how they produce hydrocarbons from around 10,000 wells. They currently use gas lift as their primary artificial lift strategy. Gas lift systems are used to extend the useful life of a production well. However, this kind of operation is prone to process volatility.

After separation, the produced gas is typically compressed by a compressor station located within the process facility. It's common to have three or more reciprocating compressors running at lower than normal utilization to compress the gas and circulate it for re-injection into the wells. These operations (production, separation, export, compression and gas re-injection) are meant to run in a continuous loop 24x7, except for planned facility downtime. However, due to environmental and operational reasons, continuous operations are often interrupted. This immediately creates an imbalance in supply and demand of compressed gas, and if not addressed quickly, puts undue strain on the compressors. This can ultimately result in a process run off situation, overloading the compressors and eventually tripping the compressor station, which directly contributes to lost production.

Just like many shale companies, this operator wants to minimize the impact of process volatility and ensure smooth continuous operations.

A Unique Three-Phase Approach

This three-phase approach builds on Kalypso’s hands-on experience helping large enterprises drive value from emerging technologies. It leverages our deep expertise in the oil and gas industry to tailor an approach designed to drive maximum value from digital initiatives, both in the near-term and with an eye toward future growth.

Phase 1: Mechanical to Digital

This phase starts by connecting a process facility to a robust Industrial IoT platform that can bring in data with low latency – securely and in real-time. By using advanced analytics, we quickly deploy edge intelligence that provides alerts when undesirable events occur, and immediately recommends actions that can prevent cascading system-wide failures.

Phase 2: Reactive to Predictive

This phase involves building on insights generated from connected operations. We leverage machine learning and artificial intelligence to proactively predict and prescribe actions to prevent undesirable scenarios in the future.

Phase 3: Organize to Scale

In this phase, success from one use case is deployed in other facilities or processes across the organization. Knowledge gained and lessons learned from the first two phases are expanded across the workforce, enabling multiple use cases that leverage industrial IoT and AI. This is when enterprise-wide business value is realized, and the benefits of a strategic digital program start to accrue.

Results

In less than 10 weeks, Kalypso built an industrial IoT solution using the ThingWorx platform that captures and aggregates data related to equipment and hydrocarbon processing – from more than 5,000 sensor points – in near real-time. An analytics engine alerts the remote operations SCADA team about undesirable scenarios and presents recommendations to stabilize the process facility. If the recommendations
are approved, ThingWorx delivers control actions by issuing revised setpoints directly to the compressors, which keeps compressor stations running smoothly.

This ability to semi-autonomously control and operate field equipment results in reduced time-to-notice and time-to-mitigate, which directly drives revenue improvements through improved well operating hours, ultimately increasing BOE. Running operations smoothly over time increases compressor station utilization, reducing the unit cost of compression. This also means that additional wells can be supported without adding more compression horse power.

As the company grows the number of wells brought online, field operations must run smoothly with a reduced human touchpoint. Safety increases when technicians, contractors, engineers and lease operators are not required to manually trouble shoot mundane equipment issues caused due to intermittent operations.

What’s Next?

The oil and gas industry is well positioned to drive significant value by building foundational digital capabilities that fundamentally transform the way they innovate.

Regardless of where a company sits – upstream, midstream or downstream – a holistic approach that addresses people, process and technology provides the most benefits.

Develop a long-term vision but start with smaller projects that rapidly prove the value of smart connected operations. Push for outcomes beyond a point of proof by demonstrating success from these smaller projects to executive management. Commit to digital goals at scale to achieve true enterprise value, like achieving growth targets and market differentiation.

Learn More

Download our eBook for more detail on key use cases where E&P companies can benefit from smart connected field operations, and how to implement SCO in shale operations.

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