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IMPLEMENTING SMART CONNECTED OPERATIONS IN THE OIL AND GAS INDUSTRY

BY SAGAR ASALAPURAM AND ERIN HALLERAN

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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.

Read on to learn about:

The SCO potential for unconventional E&P companies

Key areas where E&P companies can transform and benefit using SCO

How to implement SCO in shale operations



The world consumes 99.79 million barrels of oil equivalent (MMBOE) per day.¹ The International Energy Agency estimates that consumption will continue to grow rapidly due to a rise in the use of petrochemicals, trucking and aviation.² To meet this heightened demand, exploration and production (E&P) companies would need to increase the pace of conventional oil production project approvals, which is unlikely.

The U.S. shale industry, however, is well positioned to exceed expectations by supplying another 10 MMBOE per day by 2025. This increased production, which will be an unprecedented feat, would be the equivalent of duplicating Russian supply contributions. This is supported by the fact that since the introduction of shale production, the U.S. has increased the daily supply from 4 to upwards of 12 MMBOE in one decade.³

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As the market slowly recovers from the 2014 drop in commodity prices, U.S. shale producers are seeking innovations in production activities.

The industry, which is typically slow to adopt newer technologies, is evaluating new areas to support survival and growth in a low commodity price reality. Meanwhile, the last five years has seen an explosion in the development and adoption of emerging digital technologies (e.g. IoT, machine learning, cloud, mobile, intelligent automation, robotics and artificial intelligence). These technologies have matured through strong adoption in industries like aerospace, manufacturing, pharma, retail and medical device. They no longer carry the high risk usually associated with emerging technologies. For the U.S. shale industry, this maturation and proof of value comes at an opportune time.

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The SCO Potential for Unconventional E&P Companies

E&P companies – especially those in an unconventional space, like shale – can leverage digital technologies as stable building blocks that fundamentally impact every area of their business. There are many ways to get started, and one of the quickest paths to value is through smart connected operations.

SCO enables the intelligent connection of key business operations and leveraging of collected data to derive tangible outcomes. Data is constantly generated from shale wells and production facilities, from drilling and completion operations, and from various systems like SCADA and IT. In the business context, implementing SCO and related technologies can reveal valuable insights into E&P operations. These insights contribute to automated or autonomous decision making. When acted upon – in real-time, using edge or cloud-based industrial IoT platforms – companies achieve many highvalue outcomes. These include - but are not limited to - increased uptime, operational efficiency, worker safety and emissions control.

In order to understand the revolutionary benefits of SCO, let's consider a typical shale E&P company's operating model. They are in the business of drilling wells in the safest, fastest possible manner. Shale wells naturally undergo rapid decline in production, falling to less than half within the first 12 months. This creates a constant impetus to explore, in order to bring more production online. This churn of activity offers many opportunities to implement business improvements. All in a relatively short span of time, a company will capture acreage, lease rights, drill, complete wells, extract hydrocarbons, separate hydrocarbons, dispose of produced water and pump into export lines.



Key Areas Where E&P Companies Can Transform and Benefit Using SCO

Throughout the process, there are many areas that can benefit significantly from smart connected operations, including:



Production Forecasting:

By feeding data about field operations and constraints at production facilities in real time back into forecasting tools like Decision Curve Analysis, the processes of determining production value and making forecasts become more accurate. When integrated into daily workflows, this output function becomes an automated, intelligent process, making it possible to accurately manage production in line with quarterly targets and market conditions.

Drilling Operations:

Drilling is a significant contributor in the cost of a barrel, and SCO is an important means to reduce cost per foot drilled. Optimizing drill rig operations helps companies achieve KPI targets. By using sensor data from the rigs in real time, it is possible to quickly calculate the improvement potential of a well while avoiding non-productive time (NPT) and preventing hazards.



Compressor Utilization:

Compression stations often use multiple compressors to compress gas either for artificial lift systems or to export gas into the pipeline for sale in-market. These compressors operate at less than optimal capacity on purpose, so that in an event a compressor goes offline, others in the station can pick up the load for uninterrupted operations. SCO can preemptively address the failures from happening in the first place, allowing compressor stations to operate at higher capacity. This reduces the unit cost of compression and keeps facilities running smoothly.

Predictive Maintenance:

With machine learning, companies can create advanced models that optimally manage asset performance and downtime. Maintenance workflow management, plant dashboards and trend analyses improve operational efficiency and reliability. Currently, operators estimate NPT losses at around \$8 billion per year, which can be drastically reduced through the effective use of analytics. For example, a single pump failure could cost \$300,000 per day of lost production, and SCO underpinned by use of IoT sensors could alleviate this loss.⁴

Field Service:

This is a vital function which entails the delivery and maintenance of mission critical equipment and services from office to site. This includes deploying mobile field technicians, managing resources, ordering parts, scheduling service tickets, submitting work order reports and more. There is a multitude of disparate systems, data movement and processes at play, which SCO can streamline. This results in enhanced engagement from contractors and operators. It also results in employee productivity growth, increased operating margin and increased customer satisfaction.

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Worker Safety:

Health, safety and environment remains a nonnegotiable cornerstone in any E&P operation. By seamlessly connecting field workers with data when and where they need it, safe decisions can be made in critical situations. To empower the workforce to maintain safety in a demanding industry, leading companies use applications like man down alerts, geofencing and GPS positioning, automated alarm management, exposure detection monitors and real-time indoor positioning within production facilities.

Emissions Control:

With the boom in shale production, GHG emissions are a prominent issue in climate policy. Post-2016, the efforts to measure and control fugitive methane emissions has been largely left to industry and states. Connected sensors can easily monitor for leaks from oil tank batteries, vapor recovery units, compressor stations and venting operations. Data from those sensors can be used to automate reporting and reduce the burden of compliance to regulatory standards. By increasing the use of data and analytics facilitated by SCO, operators are showing a six-fold reduction in emissions.⁵

Produced Water Management:

The Permian basin has the highest water-to-oil ratio among major U.S. shale formations, followed by Bakken, Eagle Ford and Marcellus. In the Permian basin, for every barrel of oil produced in 2016, 6.5 barrels of water was produced.⁶ Safely disposing of or recycling this water is a challenge that has gained importance. A rise in production has also put pressure on the availability of fresh water during fracking operations. Energy companies must leverage smart connected technologies to enable innovative water management practices. The success of SCO is rooted in the basic paradigm of people, process and technology. It's about bridging the silos in operations and processes by connecting disparate data points. These connections empower employees to make faster, safer and more effective decisions. The industry has already demonstrated digital value in realworld applications. Instead of identifying and executing pilot projects with new technologies, upstream companies need to take a broad transformative approach and chart a longer-term vision.

An implementation roadmap enables companies to realize true value in E&P operations, whether it's becoming more profitable, increasing production or reducing costs. Improving operations via digital-enabled processes and technologies is now a top priority for senior executives in most upstream companies.

This top-down sponsorship needs to be coupled with employee engagement to move the needle on cultural change and attract new talent to the industry. A reinvigorated culture of innovation and technology adoption will facilitate new ways of working. Operators with an empowered, digitalsavvy workforce will maximize value capture. Soon, the days of disconnected silos will be in the past, as smart connected operations drives an environment that constantly creates new business value in the O&G industry.

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Sagar Asalapuram

Technical Project Manager Digital Innovation sagar.asalapuram@kalypso.com

Over 12 years' experience assisting clients attain sustainable results through successful implementation of transformational business process and organizational change with a focus on Industrial IoT and Machine Learning technologies.



Erin Halleran

Analyst erin.halleran@kalypso.com

Experienced in business strategy and data-based decision making. Driven by process improvement & innovation with focus on leadership and systems.



Chad Markle

Partner chad.markle@kalypso.com

Leader of Kalypso's Digital Innovation segment. Helps clients build foundational digital capabilities to create value at new frontiers and rethink how to use new digital capabilities to improve how customers are served.



John Woods

Partner john.woods@kalypso.com

Especializes in applying digital technologies to the industrial sector to improve revenue, cost and market share performance.

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