JOYN

AI Fuels the Modern Pumper

Dynamic Routing Boosts O&G Production

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WHITE PAPER

Executive Summary

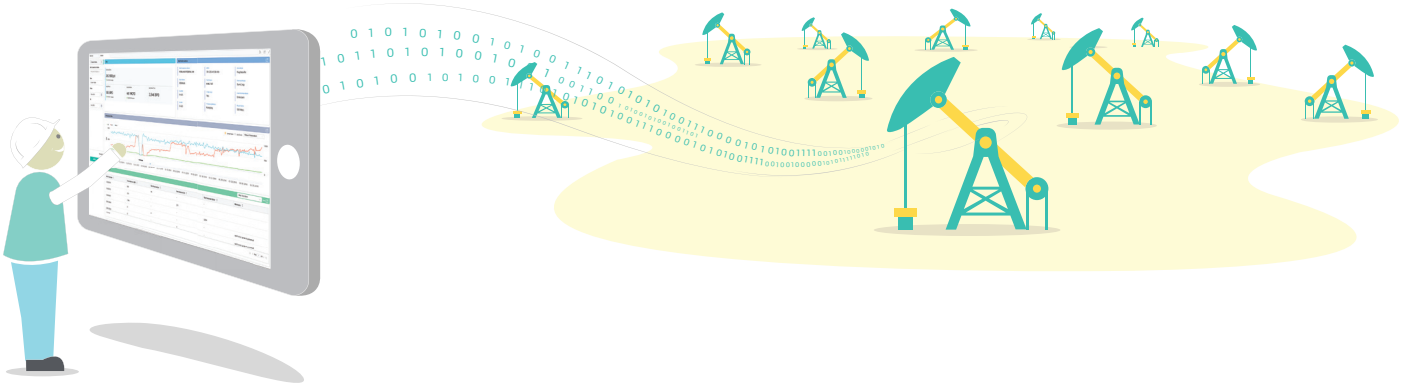
At the intersection of technology and fluctuating market conditions, there is still the potential for shale producers to ultimately yield break-even costs of $5–$20 per barrel.[1]

Operationally excellent E&P oil and gas companies don't pause innovation at the drill bit. They are equipping pumpers with disruptive technologies like mobility, big data, and artificial intelligence (AI). Such field intelligence platforms unshackle the front-line from legacy technologies that were not built with truly collaborative user engagement in mind. These new platforms self-learn business value exceptions and dynamically route pumpers to priority assets. Such E&P companies disrupt business as usual. They do business as it always should have been.

Increasing big data availability, cost-effective field intelligence technologies and fluctuating oil prices became powerful incentives for oil and gas companies to look at significantly overhauling operational efficiency with what they had control over – production efficiency.

One such innovative company, a leading independent Bakken producer with 1,600 wells, partnered with Seven Lakes Technologies to deploy the industry's first iOS mobile field data capture enterprise platform. This O&G maverick employed cutting edge mobile technologies and business integration practices to put timely operational data in the hands of lease operators.

To evolve along with industry needs, Seven Lakes' JOYN platform is on a path to equip operations with a powerful combination of industry-specific algorithms and disruptive technologies to boost productivity. The platform fuels the modern pumper by automating dynamic routing, work order completion, and safety requirements, and feeding them the most valuable data at the time they need it.



(1) Shale 2.0: Technology and the Coming Big-Data Revolution in America's Shale Oil Fields

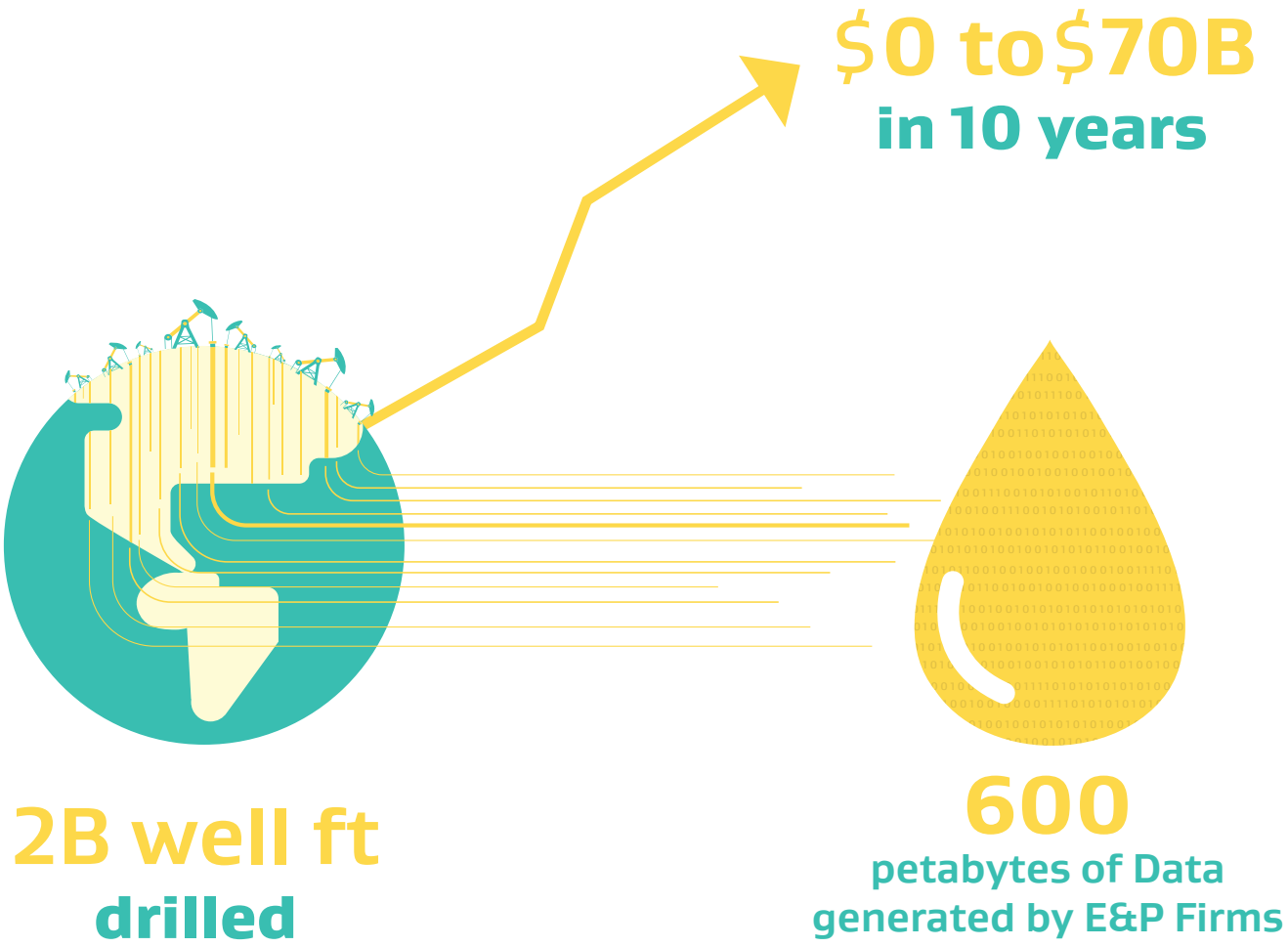
Shale Data Revolution

The old playbook is, well, played out. It is no longer sustainable to just shut-in higher cost wells, cut head count, and lay low until prices rise to produce profitably.

The revolution begins with technological developments in drilling that enabled the U.S. shale revolution to experience a profound effect on the energy markets in recent years. The revolution now must move beyond the drill bit. In the current price regime, shale producers have found that to stay competitive, or simply stay in business, bringing down production costs is not just a goal but a competitive reality.

With the advent of newer technologies and massive amounts of data produced, the industry has another way out. With nearly $600 billion in U.S. shale infrastructure investments and the nearly 2 billion well-feet drilled, the amount of data generated by E&P firms likely amounts to a massive 600 petabytes of data.[2]

The case study below explores how a leading Bakken producer has used Dynamic Routing along with Seven Lake's field intelligence solution to realize substantial operational efficiencies.



(2) Mills, Mark. Shale 2.0: Technology and the Coming Big-Data Revolution in America's Shale Oil Fields. Energy Policy and The Environment. May 2015

Bakken Maverick Innovates

The subject of this case study is a leading 1,600 well E&P company operating primarily in the Williston Basin. The company has grown its operations in the Bakken shale formation rapidly, going from 2 rigs in 2010 to 16 today, adding 18 to 20 wells a month along the way. Its production reached 50 MBOE/D in 2015, with 228 MMBOE in proved reserves. To help manage its growth, the company harnesses Seven Lakes' JOYN field data gathering solution to improve its production cost profile and enhance overall productivity.

The company is one of the first in the industry to capitalize on the ability of an FDG solution to provide actionable insights from the massive amounts of data created by its field intelligence sources. The Bakken producer used these insights to restructure its processes and wring efficiencies from its production activities.

"We have been able to increase our production by 1-2% while reducing drilling projects and opex."

- Greg Jensen

Greg Jensen*, Bakken producer's Director of IT, first came into contact with Seven Lakes at an Oil and Gas CIO roundtable meeting. At the time, the company's rapid growth was stressing its outdated and heavily manual processes. In addition, their existing reporting solution had become cost prohibitive and underpowered. The company was running their field data gathering on an obsolete tablet device available only on Ebay for a hefty price. To make matters worse, the monthly licensing fee for the reporting solution was charged on a per well basis – not an attractive model for a hyper-growth company.

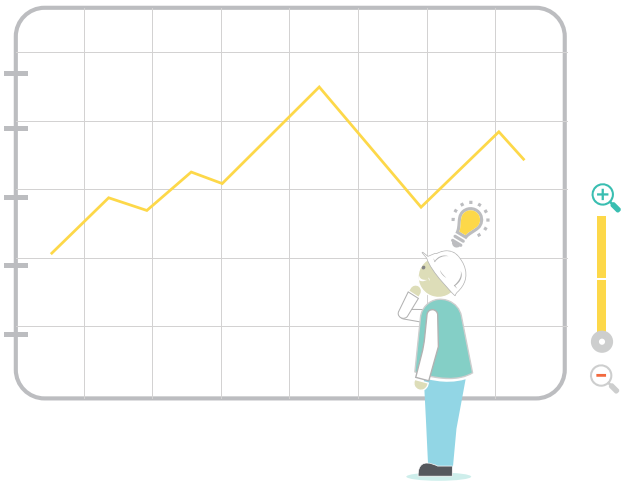
Jensen was intrigued by Seven Lakes' production dashboard, which led him to set up a 90-day trial to get the solution out to the lease operators for use in the field. The feedback was resoundingly positive. "It became really clear that this was the right solution," he said. His motivation for recommending the adoption of the software was driven by a desire to get more information and more power in the hands of the lease operators. "The more they understand the implications of their wells being up and running and producing, the better," he said, adding, "Knowledge is power from that perspective."

**Pseudonym to preserve privacy. Please contact Seven Lakes for referrals on current users of our software.*

“In just a few minutes the user was able to drill down from trend graph all the way to the individual charge, then pull up a copy of an invoice that had actually gotten misquoted. In the past that could have taken hours or days to accomplish.”

- Greg Jensen

With the company inundated by data from SCADA and other sources, like every other E&P these days, Jensen placed a high priority on finding a solution that helped the company make sense of all that data. An incident during the testing phase helped demonstrate the ability of Seven Lakes to offer assistance in this regard: One particular user noticed a bump up in the graph in an area that shouldn’t have been there. He was able to go and drill from the trend graph all the way down to the individual charge, then pull up a copy of an invoice that had actually gotten misquoted.



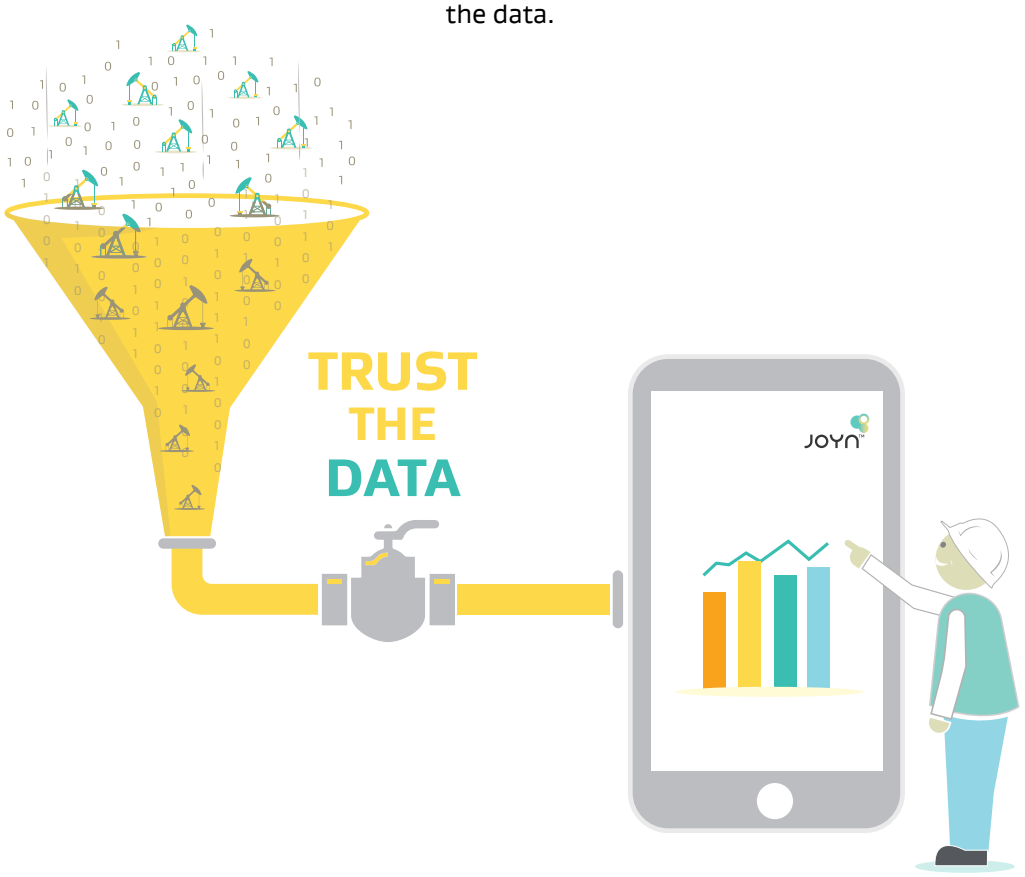
Disruptive Mobile Technologies

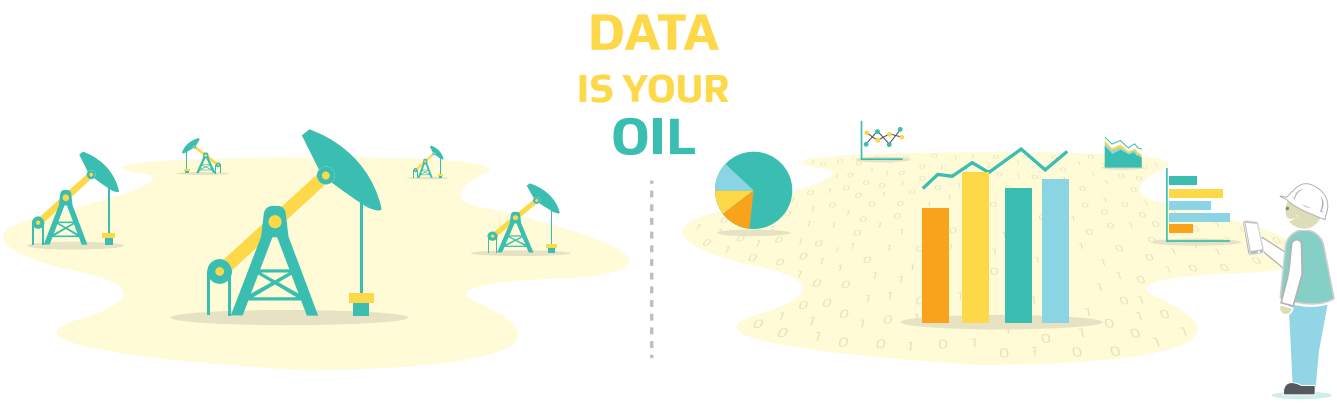
"SCADA is great as long as you validate everything you see upfront. If the operators don't trust the data, your ability to get them to act on the insights it can generate will be extremely limited. You've got to make sure all those things match up, so there's got to be a lot of checks and balances to test these out to make sure it's right."

- Greg Jensen

Mobility in the field refers to the combination of a JOYN FDG platform and a lightweight smart device that offers lease operators and other company personnel access to data and insights in one place. Use of Seven Lakes' JOYN field data gathering solution allowed the Bakken producer to keep in touch with the pulse of the field, both by gathering data from lease operators and providing them with actionable intelligence at the wellhead. The key function of the software is to aggregate and make sense of the massive amounts of data generated by the company's operations. Operators can use portable devices such as iPads and iPhones to receive and report this data in real-time.

While much of the data generated by SCADA was available to the company before adopting Seven Lakes' solution, unless data of this type is presented in a format that makes it easy to analyze and deliver actionable insights, its value to lease operators is minimal. Jensen explained that the company's prior experience with SCADA data generated from acquisitions the company made had not been ideal. Some of the systems processing the data "weren't really checked out to ensure that they were working properly." Incomplete or inaccurate information derived from such an approach can create lack of trust in the data among lease operators, making it hard to properly utilize the data.





Trust The Data

How do you get lease operators to trust the data?

This is where Seven Lakes JOYN platform truly shines. By placing reliable insights derived from effective data analysis in the hands of pumpers and foremen, you earn their trust, making it easier to get them to take action on the insights provided by the platform. This enables operators to move away from the traditional workflow model, often consisting of Excel spreadsheets on laptops, and migrate to the Seven Lakes platform accessible on their iPads. The data offered via this platform allows lease operators to make decisions that serve to reduce downtime and more efficiently service their wells. Making these insights available to operators in the field is the key disruptive factor in enabling them to function more efficiently.

Seven Lakes' ability to effectively integrate this data into an operational format by offering analytical tools that enable operators to quickly spot notable well activity was very attractive to the Bakken producer, which has become fanatical about scratching and clawing for every ounce of efficiency from its operations. Accomplishing this mission is fueled in large part by the information the company can put in the hands of lease operators and decision makers.

This enables the company to answer basic questions such as:

- What something is projected to cost and what it actually costs
- What type of ongoing issues are affecting a project
- Whether the project should be continued

Answering these questions provides valuable actionable information. “If I can provide that level of granularity to a wide variety of audiences that need it, that gives us the visibility we need to really tighten up our operations and work more efficiently, which is critical these days.”

With lease operators out every day collecting specific information on things such as volume, pressure, temperature, specific gravity, water production, water injection, etc., Jensen stressed the importance of taking in this data and making use of it via the JOYN platform to give operators a better sense of what’s going on. The mobility of this data is a crucial prerequisite for empowering lease operators to work more efficiently.

Dynamic Routing Technique

As the company’s lease operators learned to trust the insights gathered from JOYN FDG software, the next step for the Bakken producer was to find a way to systematically put those insights to use. Dynamic Routing, the process that enables pumpers to focus on servicing the highest priority assets, rather than diluting their efforts by visiting wells that don’t require service at a particular point in time, offered a means of accomplishing this.

The process relies primarily on algorithms that use cascading logic about business priorities. The technique then generates recommendations for improving and optimizing field level activities. Management by exception, in conjunction with field data gathering software, offers tremendous opportunities for reducing costs and increasing productivity in the energy industry.

The following example demonstrates the Dynamic Routing process: Suppose you have 20 wells on an existing route, but one of them that is connected to SCADA is experiencing tubing pressure that is below 30 psi, with normal being 145 psi. A disparity of this magnitude likely indicates potential downtime. If you have 5 wells in this condition, with 3 of them producing significant volume and 2 with lower production, prioritizing the 3 large producers is the optimal approach to take. Dynamic Routing makes this possible by enabling you to place these wells at the top of the route list.

Speaking of the philosophy of having an operator at every well every day, Jensen said:

> “Traditional Routing doesn’t scale. If I have a hundred wells, that’s fine. If I have a thousand wells, it’s not so fine. If I get ten thousand wells, then, holy cow what do I do?”
>
> *- Greg Jensen*

While the traditional approach of visiting every well every day may remain viable if you are servicing a small number of wells, the ability to pursue this approach in a cost-effective fashion dwindles as the number of wells increases.

Seven Lakes' JOYN solution pulls data from SCADA and production allocated data to enable this. The tool integrates with a wide range of SCADA systems, including Cygnet, Promac, Xspoc, ClearSCADA and many more. Maximizing the utility of the data you are already producing allows you to optimize your existing technology investments. JOYN is unique in its ability to gather data from your core systems and SCADA systems to prioritize assets.

The process of moving to Dynamic Routing is best approached in phases, according to Jensen. He described the overall process the company used as follows:

- **Device Shift:** It starts by taking a quantum leap and going from grease sheets to iPads.
- **Automated Data:** Then you take another step and put automation data on an iPad, and let the operators look at it every day and start gaining trust in it.
- **Proactive Dispatch:** The next step is to move to proactive dispatch, only visiting a well when there is an issue, while the computer directs you where to go. "It's smart, it can take a look at transportation and distances and locations and route you intelligently and do it quickly."

Getting to the final step doesn't happen right away, Jensen stressed. "You've got to take some steps to get there. You can't just throw all that in their lap overnight."

Boosting Production Efficiency

"Going back in history, we've driven the break-even price of oil down from the 80s to the 30s in just a period of 2 or 3 years. I sincerely believe that we could probably halve the break-even cost again and compete at 20-dollar oil."

- Greg Jensen

The JOYN platform provides the following efficiency-enhancing functions:

- **Event-based algorithm**: Events can include compliance, production, or safety goals.
- **Nearest neighbor algorithm**: This helps find patterns in collected data. For instance, while you can determine fairly easily the highest producing well on a route, then the next highest, etc., this doesn't take into account the distances between the stops. JOYN Dynamic Routing application clusters together different stops based on the priority score attributed to them by the system. For instance, you might have a high point stop later in the route because it isn't economical to drive to that point and back at an earlier point in the route. Use of the point system in this fashion enables the software to optimize the route.
- **Clustering based on distance and operational goals**: These goals can be production, compliance, or safety based.

Jensen believes analyzing and automating workflows is crucial for oil and gas producers in the current price environment.

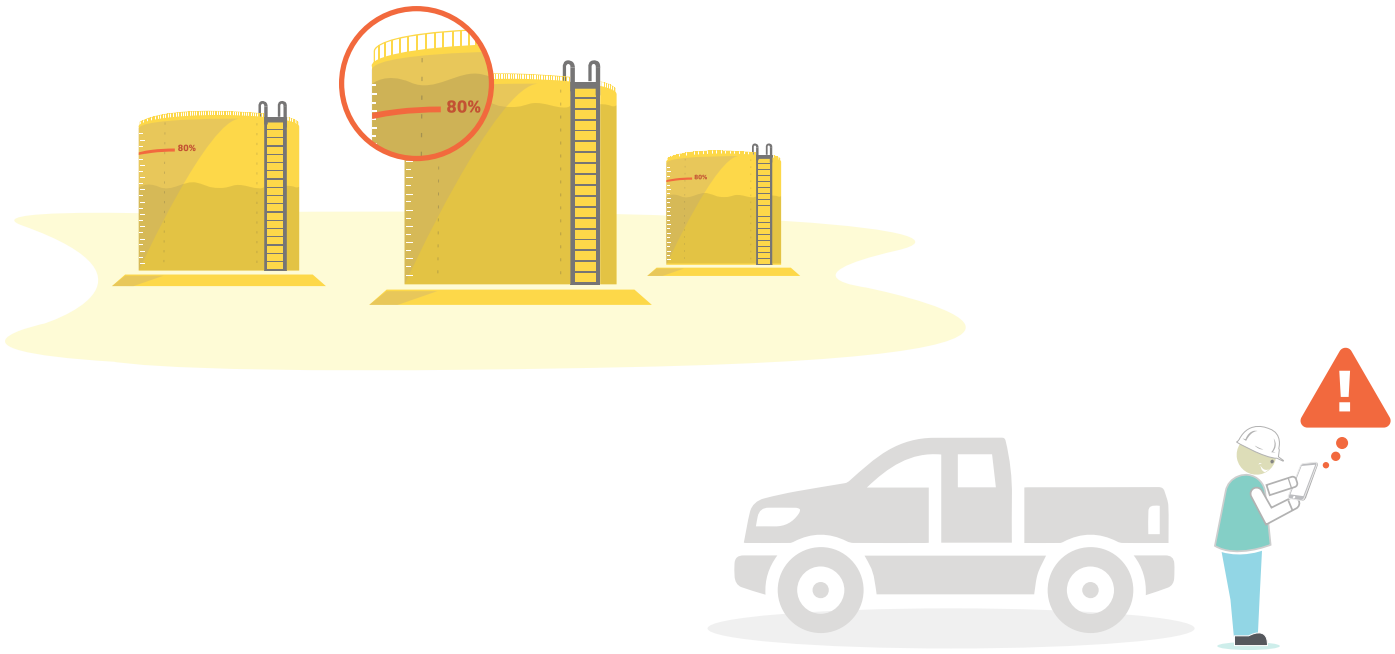
Jensen sees continued cost reductions as necessary as the number of wells rise. "As you up your well count, as you have to do to maintain or grow production, you can't be throwing an army of people at that. If you do, it just gets to where it's insurmountable and you're driving your costs up versus down." Automating this process is key, in his view. "If I can get more automation and less lease operators out there driving around a well every day, that helps cut my lease operating expenditures down considerably."

Another significant benefit offered by the software is the ability to preserve and expand institutional knowledge. Previously, this knowledge would be lost to a company when an employee retired, but with JOYN it can be captured for future use. Irregularities that might be missed by less experienced operators can be encoded in the system in the form of indicators requiring attention when they occur.

Enhancing Safety Standards

In addition to boosting productivity, JOYN helps enhance the safety of your operations. For instance, consider a scenario where a tank has SCADA data or your operations staff predicts tank volume/tank height based on average well production at the stop. If the tank reaches a dangerously high level that could result in an overflow if the well is still producing into the tank, FDG enables the following:

- Pumper is alerted in advance when tank is 75% to 80% of capacity
- Pumper is routed to the tank to confirm the alert and can do one or more of the following:
  - Transfer the oil to another tank
  - Switch the well to produce into another tank
  - Call for a run ticket for a truck to pick up the oil
  - Shut the well in, as a last resort, if nothing else is possible to prevent overflow of the tank



Facilitating Centralized Compliance

E&P firms face significant regulatory compliance burdens related to exploring for, and especially, producing oil and gas. Multiple compliance reporting obligations must be fulfilled to meet the requirements of agencies such as BLM, SPCC, GHG, and general EH&S. When each compliance inspection record is stored in different systems or via different methods specific to an inspection, such as Excel files, paper files, MS Access database, custom applications or off-the-shelf applications, it causes pumpers to spend an excessive amount of time collecting data in multiple formats. The necessity to manage multiple systems and search for the right files when needed results in high overhead costs.

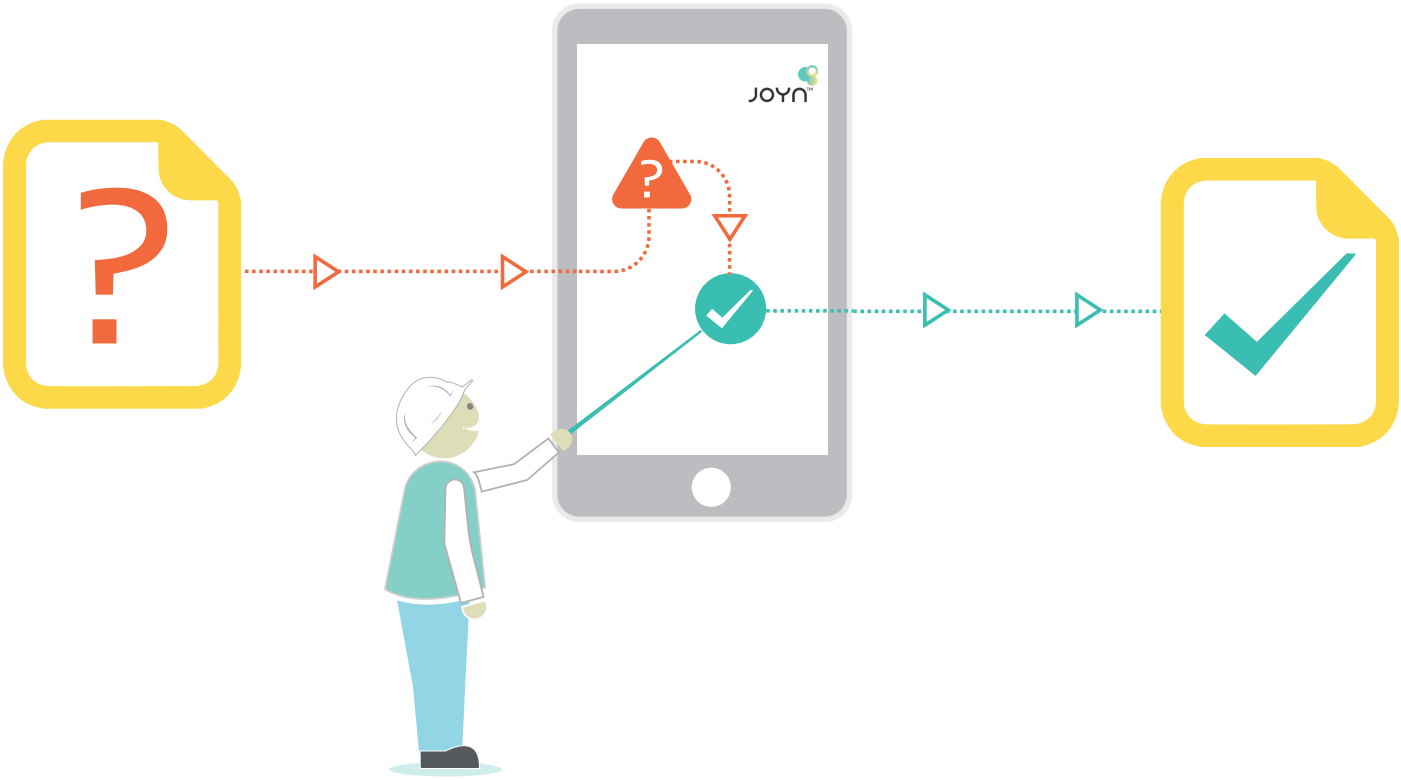
With JOYN, these issues can be alleviated as follows:

- All forms are configured and centralized in FDG
- All data collection is now electronic and centralized
- All reports can be configured on the JOYN platform for ease of access
- The cost of compliance is reduced and compliance efficiency is increased

Visualizing Work Order Completion

The Bakken producer plans to expand its use of the software to encompass other functions where value can be added to its operational processes. One such function is the ability to create work orders from the system itself, rather than relying on legacy procedures that can slow the process substantially.

Work orders are created by pumpers to fix problems of one sort or another at a well. Traditionally, these were created using paper or a legacy system's work order functionality. Doing so often involved visiting the company office or going home to print out a form to send to headquarters. Moving this to JOYN enables this process to be sped up considerably. It unites the work order process with a company's FDG system, avoiding the inefficiency involved in creating work orders on separate systems.



JOYN

The Industry Advantage

When describing why the company chose Seven Lakes as its partner in using technology to drive down costs and improve operational efficiency, Jensen said:

"The big thing for me is that Seven Lakes really focuses on and understands the oil and gas business."

The spread of field intelligence products incorporating big data, AI, and mobility in the oil and gas industry is still in the early stages. As a leader in field intelligence software, Seven Lakes continues its commitment as first to market, getting customers to do business as it should have been, and equipping them with the cutting edge new developments in the field.

Unlike software companies for which the industry is just a check-off vertical, he believes that Seven Lakes' specialization makes a "huge difference" in distinguishing the company from its competitors. "At the end of the day you can say that technology is just moving a bunch of electrons around, but we move those around in a very specific pattern in oil and gas that is a bit different from other businesses. So that in-depth domain knowledge to me is a critical differentiator."

ABOUT THE AUTHOR

Sowmya Murthy, CMO

Sowmya Murthy, Chief Marketing Officer at Seven Lakes Technologies has a passion for measurable revenue growth outcomes by implementing disruptive business strategies, product roadmaps and market leadership campaigns for B2B technology companies. She has 15+ years of insights in leading product marketing, demand generation, brand awareness, strategy consulting and start-up initiatives.