Harnessing Technology in a Volatile Market

With unstable oil pricing, improving operational efficiencies can help companies squeeze higher volume with less investment

BY YOGESH KHANDELWAL AND DAN LIGGETT

The plummeting price of oil has hit the oil industry hard. Last year, tens of thousands of workers were laid off. With so many company closures and mergers, scheduled projects were canceled or shelved indefinitely. Earlier this year, job cuts in oil-related organizations increased by 40 percent, and energy companies reported plans to lay off more than 100,000 workers worldwide. To date, seven U.S. oil companies filed for bankruptcy in 2015, and credit ratings agencies expect more to come.

While slashing costs through payroll is a short-term solution to market realities, there can be long-term negative consequences. The industry risks losing too many skilled professionals, and the job reductions may put too much stress on remaining workers, resulting in even more turnover. Replacing those skilled employees in the future will be challenging, at best.

Many companies have found another way to cut costs and increase efficiencies. Their solution is to leverage technology—both out in the field and inside the office. Companies can become more efficient when developing well sites, extending the life and productivity of existing wells and extracting oil, while streamlining processes within the organization.

A Changing Industry

So what caused oil prices to drop in the first place? Oil-producing nations began pumping more product than the market could handle. Through hydraulic fracturing, the ability of U.S. drillers to tap into the oil trapped in shale resulted in an increase of nearly 4.5 million barrels per day since 2008. Normally, the glut in supply would have led to a decrease in production. But in this case, oil-producing nations in the Middle East didn't want to lose customers to U.S. shale drillers, so they kept production high. The excess supply pressured oil prices lower.

From 2010 until mid-2014, world oil prices were fairly stable at $100 to $110 a barrel. At that price, companies had the financial incentive to develop new wells and lay hundreds of miles of pipeline. They were willing to invest millions, even billions of dollars on the likelihood of a substantial return on that investment. They put tens of thousands of people to work. However, as the price fluctuates between $40 to $60 a barrel, an industry once poised for a massive build-out has now become crippled.

Maximizing Existing Resources

Industry leaders are increasingly trying to adapt technological solutions that will allow their companies to retain a high level of production, but at much lower costs. The results have been remarkable. The U.S. Department of Energy (DOE) expects the average daily production for the year to be slightly higher than in 2014, despite the drop in prices. Predictions are that production will rise from 8.7 million barrels per day last year to 9.2 million barrels in 2015.

The New York Times reported in May that production has barely declined despite the price drop. Oil producers are utilizing available technology to efficiently coax more oil from older wells. They are saving money and getting better return on investment.

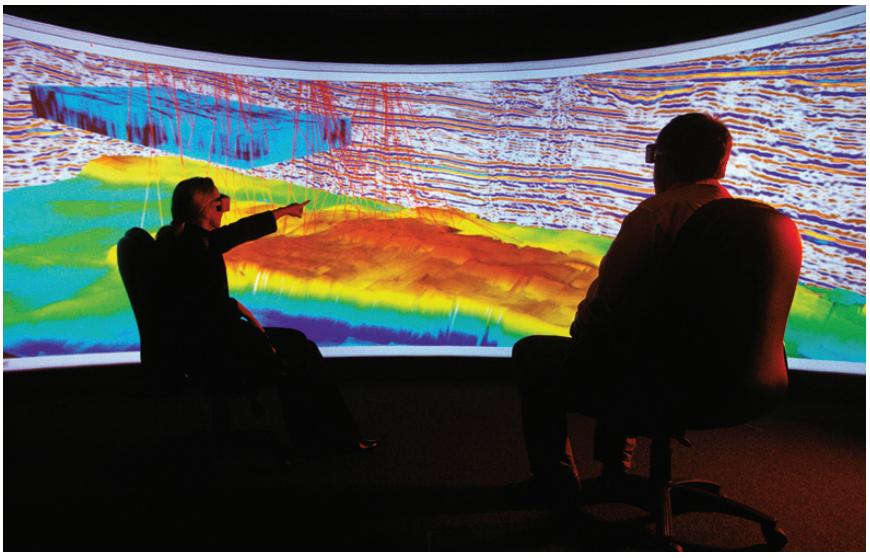
There are a number of technological solutions available to oil producers, according to Mike Chadsey, Director of Public Relations for the Ohio Oil and Gas Association. "The advances in seismic technology are making a big impact on the industry. Engineers have developed sensor technology and mathematic models, first developed for deep offshore drilling, to see the rock better," he said. "As drilling proceeds, imaging technology finds natural cracks in the rock that drillers can use when fracturing. They also can map the new cracks. With that information, they know how close they can drill another well without pulling production from the first. Seismic technology provides information about what is in the rock, as well as its thickness and depth,"

Companies also are drilling faster and have effectively reduced the time it takes to drill a well by 33 percent. In addition, using the technology helps drillers ensure they are focusing their wells in parts of the foundation known to be the most prolific. Efficiencies made possible by using the technological tools available have reduced production start time for a new well from weeks or months to only a few days. Improved speed of bringing new wells online reduces the financial risk of drilling and increases the odds of a favorable return on investment.

Increasing Efficiencies in the Field

The DOE is monitoring technological developments and sees much promise in tertiary or enhanced oil recovery. Crude oil development and production in U.S. oil reserves can include up to three distinct phases. During primary recovery, the natural pressure of either the reservoir or gravity drives oil into the wellbore. Combined with mechanical lift techniques such as pumps, this brings crude to the surface. However, only about 10 percent of the reservoir's oil is produced through primary recovery.

Secondary recovery, where water is injected to displace oil and drive



Seismic technology helps identify the best location for hydraulic fracturing and provides information about what is in the rock.

it into the wellbore, is able to extract 20 to 40 percent of the original oil. It also extends the well field's productive life. The third—and most efficient method—is an enhanced oil recovery technique. Using this method, producers have been successful in extracting 30 to 60 percent of the original oil in place.

Several methods of enhanced oil recovery have been proven commercially successful in varying degrees. The DOE reports that carbon dioxide (gas) injection is getting the most commercial attention. Introduced in 1972, it has been used successfully throughout the Permian Basin of West Texas and eastern New Mexico. Now, it is being pursued in Kansas, Mississippi, Wyoming, Oklahoma, Colorado, Utah, Montana, Alaska and Pennsylvania. Most carbon dioxide for enhanced oil recovery had come from naturally occurring reservoirs. However, new technologies are being developed to produce carbon dioxide from such industrial applications as natural gas processing, fertilizer, ethanol and hydrogen plants in locations where naturally occurring reservoirs are unavailable.

One example is the Dakota Gasification Company's plant in Beulah, N.D. It produces carbon dioxide and delivers it by a 24-mile pipeline to the Weyburn oil field in Saskatchewan, Canada. Encana, the field's operator, is injecting the carbon dioxide to extend the field's productive life. The company hopes to add another 25 years in well life and as much as 130 million barrels of oil that might otherwise have been abandoned. Such technology is reducing the need and expense of developing more wells, thereby creating substantial efficiencies that are cutting costs of oil production.

The DOE's research and development team is assessing the next generation of carbon dioxide enhanced oil recovery techniques, which the agency reports have the potential of increasing the productive life of oil reservoirs to an even greater extent. Such methods show that technological advances can serve as a hedge against volatile commodity prices.

Intensive research and development is in progress to reduce the amount of water used in hydraulic fracturing. The process uses between 1.2 and 3.5 million gallons of water per well, with large projects using up to 5 million gallons. Pumping water into the well at those amounts creates environmental and social concerns, so researchers are investigating materials to replace it in the fracturing process.

Increasing Efficiencies in the Office

While technology offers significant efficiencies in the well fields, an increase in productivity can also be achieved by streamlining internal processes. Robust technology that reduces or eliminates manual processes will lessen errors and increase staff productivity. This enables company resources to be focused more on analysis and operational improvements, and can be especially helpful for oil companies facing a staffing shortage due to layoffs. Such solutions also enable proper regulatory reporting and better royalty ownership management.

A significant pain point for many companies is the lack of a centralized data management system. In many instances, organizations undertake expensive energy-related projects with antiquated data-storage systems and administrative tools. Such inefficiencies hamper staff and cause companies to lose money, something they can ill afford in these times of low oil prices.

Advances in web-based software can help companies achieve an enhanced level of operational control. By managing their operations more cost-efficiently,

From acquiring leases to managing encroachments and inspections, web-based software offers an enhanced level of operational control while minimizing costly errors.

companies can capitalize on margins with better pricing into the future. And with improved operational and project management efficiencies, companies can continue with exploration and development without significantly scaling down facilities or payroll. Such actions can serve the organization well in the long run.

With a central database, authorized personnel gain quick access to comprehensive information on new, existing and future projects. It offers a centralized repository to manage all land rights and infrastructure asset information, enabling the organization to complete right of way projects in a real-time, paperless environment that facilitates collaboration, efficiency and error reduction. Other advantages include mobile and detached applications that provide online or offline capability in the field. GIS mapping can further broaden the use of information.

Many of our clients have experienced levels of productivity beyond their expectations, finding it well worth the time and investment. For example, Melissa Christensen, a Right of Way Specialist for engineering services company KLJ, says, "Maximizing an internal database provides our staff with an important value-added component during planning and project management. We have found that our web-based software facilitates a one-stop shop of tasks and requirements necessary for project completion. And with an added level of quality control, we are seeing efficiencies in land acquisition, landowner management and the workflow of field agents."

Streamlining through Automation

Another significant cost that comes early in establishing an oil-drilling site is acquiring leases for land and mineral rights and managing drilling schedules. Web-based software helps streamline workflow, while eliminating costly errors. It offers an automated and paperless way of managing lease checks, recurring payments, nonpayment obligations, mineral title research, legal processes, environmental studies, depth severances and property ownership. It also alleviates the labor-intensive process of calculating and issuing lease payments.

After the right of way agreement has been reached and the pipeline installed, companies are often faced with managing property encroachments, inspections and repairs. This process can also be streamlined with a centralized web database. Automated reports prompt communication to appropriate individuals of the need to inspect the infrastructure, make repairs, cut trees, mow or spray. In addition, a schedule of maintenance checks can be uploaded so workflow reminders are issued automatically. With mobile technology, workflows can commence in real time.

Consider, for example, the process of spraying vegetation in the project right of way. Some landowners within the project might allow the company to spray, while others may not. There may even be some owners who will only allow spraying of certain areas. Maintaining these requests can be confusing to a contractor. Information kept in a central database keeps it simple. It even provides an audit of completed work, thereby eliminating any possibility for errors.

Another benefit of a central, web-based system is the ability to broaden the use of information with geographical information systems (GIS) mapping. With quick access to tract boundaries, the path of a new midstream project or the impacted area of pipeline designated for restructuring can be uploaded into the database. Issues related to construction, such as existing land use and utilities, are identified in the GIS color-coded layers. Progress toward right of way acquisition or the necessity for rerouting the pipeline can be recorded. These and other advantages make GIS an efficient replacement to the hundreds of paper maps that some midstream companies still maintain.

Summary

The need for energy is fundamental, and oil continues to be a primary source for energy. So, it is not surprising that the plummeting price of oil sent shockwaves through the U.S. oil industry and abroad. It is a market reality that has challenged leaders of one of the world's largest industries. As a result, companies are now tasked with doing more with less. This is where technology, both out in the field and inside the office can help.

By utilizing a central database through a web-based platform, some have experienced an average increase in efficiencies of 35 percent and a dramatic reduction in errors and duplication. Those results, applied to projects costing millions, even billions of dollars, produce a dramatic return on investment. The efficiencies made possible through technology applications can produce measurable cost savings, offering practical solutions for a global oil industry challenged by fluctuating prices and other market changes. ✪

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