



Highlights

Dramatic changes across the oil and gas industry require new approaches for managing information, analyzing patterns and optimizing outcomes in both upstream and downstream operations. Forward-thinking oil and gas companies will turn information into actionable insights in order to:

- Enhance exploration and production.
 - Improve refining and manufacturing efficiency.
 - Optimize global operations.
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Energy excellence

Maximizing returns in the oil and gas industry

The oil and gas industry is risky, highly political and wildly expensive. It is also critical for every person on the planet. It fuels nearly every other industry in the world, from agriculture to information technology. Oil and gas heat our homes, power our vehicles and help grow our food. It is no wonder that global energy demand is expected to grow by more than 33 percent by 2035, with most of that energy being supplied by oil and gas.¹

This global dependency on oil and gas leads to intense scrutiny by governments, regulatory bodies, investors and ordinary citizens. The eyes of the world are fixed upon this USD10 trillion market, and the industry has little margin for error and even less for inefficiency. Mistakes and waste can quickly lead to bad publicity, speculative swings, legislative action and competitive disadvantage. It is an industry that must operate as efficiently and cleanly as possible.

Fortunately, oil and gas companies today have all the tools and capabilities they need to do this. Cutting-edge technologies such as horizontal drilling and multilateral wells are expanding and improving yields, and the means to monitor and manage environmental impact are increasingly reliable. But perhaps the most valuable advance in the industry is the availability of massive, hugely valuable data sets, a vast resource unto itself which is capable of propelling oil and gas companies into a new era of efficiency.

There is still much work to be done, of course. This big data alone won't solve the industry's problems. In particular, critical data is not currently shared across tools or processes, either within or between companies. But with the amount of data already being captured, and the opportunities



Smarter oil and gas

and insight that data could provide if it were integrated and analyzed in real time across the industry's global landscape, even small improvements could add up to billions of dollars in payoffs.

The industry imperatives

The oil and gas industry boasts some of the most advanced geologic and chemical science in the world. It is not the science that is holding these companies back. It is the inability to manage and coordinate data, extract insight and increase productivity that costs these companies billions year after year. From the discovery of new reserves, to streamlining global operations, to maximizing the yield of old and new wells, oil and gas companies are leaving money and product on the table.

To this end, there are three industry-wide imperatives that nearly all stakeholders agree are the keys to building a smarter oil and gas industry:

1) Enhance exploration and production

The harder it becomes to find oil and gas reserves, the greater the need for better, more reliable information that can support timely decisions. It has been estimated that a single well can generate more than 200 DVDs worth of production data daily. Right now, petroleum engineers can spend as much as 60 percent of their time sorting, validating and maintaining that data to better manage well performance.

By integrating seismic and geologic data from multiple sources, and using advanced data modeling combined with supercomputing, companies can increase their success rates in locating remote resources and unburden their engineers to focus on more productive work. Analytics, optimization and visualization techniques can render larger amounts of complex data in more intuitive ways, allowing engineers to improve their decision-making and, ultimately, their production effectiveness. For example, to find substantial reserves, Madrid-based Repsol recognized that its best options lay farther offshore in fields difficult to find and produce. However, by optimizing advanced

seismic information and utilizing new technologies, Repsol increased its offshore drill success rate to 50 percent—against an industry average of 20 percent.

2) Improve refining and manufacturing efficiency

In downstream operations, oil and gas companies face thin margins and are under constant pressure to manage costs. Short-term volatility in both the supply of raw materials and the demand for products requires greater insight, flexibility and responsiveness from refining and manufacturing operations in order for the companies to remain competitive and profitable.

In particular, real-time visibility into operations can help control costs and optimize the performance of assets, facilities and employees, which allows nimble reactions to issues such as market dynamics, weather and logistics. It can also help improve safety, reduce environmental impact and track regulatory compliance. For example, one global oil refinery now has the ability to run production simulations to optimize plant runs using real-time data for decision support. This means that if a supplier ship with a particular type of crude suddenly becomes available, the company can use real-time information about market demand, price and plant capacity to perform “what-if” scenarios and decide if it should change production operations to refine that crude. The end result is no more missed opportunities that might have led to a higher margin.

3) Optimize global operations

Few industries are as inherently global as oil and gas, but the challenges of operating an oil and gas company as a globally integrated enterprise remain daunting. A key challenge is sharing operational information, including field, plant, pipeline and logistics data across sites, organizational units and geographies. To do this, companies are increasing the visibility and flexibility of their supply chains using sensor-based technologies across their entire global operation. And by analyzing this supply chain data, they can improve and integrate decision support, like one global oil company that simultaneously monitors the flow of oil

Smarter oil and gas

from more than 100 fields and nearly 50 gas-oil separators, through 11,000 miles of pipeline, into seven refineries and chemical plants—using only two dozen people in one remote location.

The path to smarter oil and gas

Oil and gas companies will increasingly compete on the quantity and quality of their data. At IBM we believe that in many industries, a company's ability to analyze, integrate and act upon data will separate the winners from the losers. Through extensive work with clients in the oil and gas industry, IBM has developed a series of steps that, if taken in a logical sequence, can address each of the imperatives discussed above.

Stage 1: Instrumentation and production data capture

First, implement field, well and refinery instrumentation for surveillance of critical points: from surface, seafloor and wellbore data-gathering devices to real-time data feeds from pipelines and refinement facilities. This instrumentation and data capture can provide real-time, system-wide visibility to better see and understand operations.

Stage 2: Data management and integration

Then, integrate the information using standardized upstream, downstream and enterprise data for a cross-functional view. In this stage, the data is set up for easy, rapid-access sharing and analysis, either automatically by applications or by staff that employs web-based, front-end portals.

Stage 3: Intelligent alerts and event management

Next, inform operations by monitoring critical performance factors and enabling rapid responses. By building on a strong foundation of instrumentation and integration, organizations can begin using data from multiple sources to set up intelligent alerts and event management. Compliance management—including corrective actions and action-tracking processes—can be integrated with operational management, with workflows organized to better leverage the intelligent alerts.

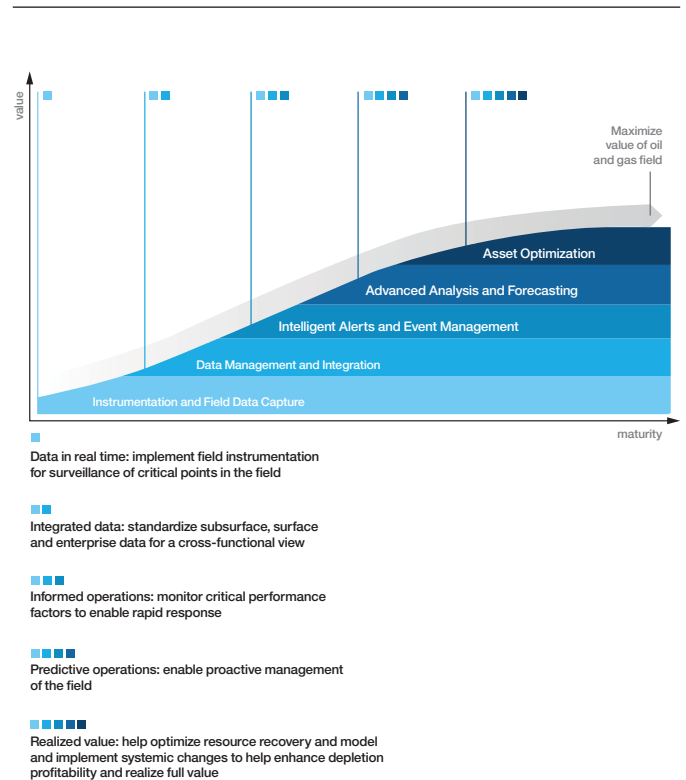


Figure 1. The path to smarter oil and gas.

Stage 4: Advanced analysis and forecasting

This step helps move field and refinery operations and management toward proactive decision-making. Predictive analytics can assess and forecast the performance of wells, facilities and pipeline systems. Models can provide insights into alternatives, along with changes in current operations, life-of-field depletion planning and refinery production scheduling. Companies can gain greater visibility into overall field and refinery performance, which is essential to more comprehensive reporting, better forecasting, faster responses and higher-quality decisions and actions.

Step 5: Asset optimization

Finally, optimize field and refinery assets through operational modeling and predictive analytics. In this last step, the producer can optimize assets by sharing information across functions, visualizing interactive data and collaborating both inside and outside the company.

The potential value of following the path to smarter oil and gas becomes clearer when its financial potential is calculated through return on investment (ROI) modeling tools. Producers can use them to assess the investments required to transform virtually any field and estimate the kind of return that is possible from each capability gained along the path.

Striving for energy excellence

The oil and gas industry has never been an easy business, but it might just be getting a bit easier. Data has the potential to do for this industry what oil and gas did for so many others: rapidly accelerate growth and efficiency. That is why it is critical that oil and gas companies use the data available to them to maximize the return on every investment dollar and recover every drop of oil. The degree to which it can do this will depend on the vision of its leaders, as well as on the ability of its business partners to collaborate and support this unique industry and its global mandate.

For more information

For more on how to build a smarter petroleum and chemicals industry, please visit: ibm.com/chemicalspetroleum



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Route 100
Somers, NY 10589

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¹ International Energy Agency - World Energy Outlook 2012 (Nov 2012) - <http://www.worldenergyoutlook.org/media/weowebbsite/2012/PresentationtoPress.pdf>



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