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## Highlights:

Dramatic changes across the oil and gas industry require new approaches to manage information, analyze patterns and optimize outcomes in both upstream and downstream operations. Forward thinking oil and gas companies will turn information into actionable insights to:

- Enhance exploration and production
  - Improve refining and manufacturing efficiency
  - Optimize global operations
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# Energy Excellence

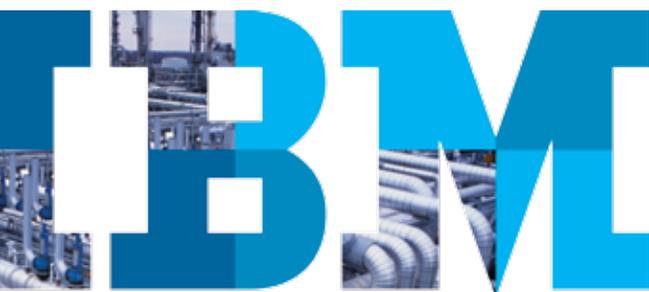
## *Maximizing returns in the oil and gas industry*

The oil and gas industry is risky, highly political and wildly expensive. It's also critical to every person on the planet. It fuels nearly every other industry in the world, from agriculture to information technology. In fact, worldwide energy consumption is expected to grow 53 percent between 2008 and 2035, with most of that energy being supplied by oil and gas.<sup>1</sup> It heats our homes, powers our vehicles, and even serves as a key ingredient in paints, detergents and clothing.

That the world is so dependent on oil and gas tends to complicate this otherwise straightforward industry. Because it is so critical to the global economy, the industry is subject to intense scrutiny by governments, regulatory bodies, investors and even ordinary citizens. Depending on which of these stakeholders you ask, oil and gas companies are expected to increase productivity, at lower cost to consumers, with less market volatility, all while managing the international political dynamics and protecting the environment.

Whether these demands on the oil and gas industry are reasonable is beside the point, however. The truth is that the eyes of the world are fixed upon this \$10 trillion market, and as such, this industry has little margin for error, and even less margin for inefficiency. Mistakes and waste can quickly lead to bad publicity, speculative swings, legislative action and competitive disadvantage. It is an industry that should and must operate as efficiently and cleanly as possible.

Fortunately, the oil and gas industry has at its disposal all the tools and capabilities it needs to do this. The technology and instrumentation to improve visibility, operating efficiency and decision making already exists and is being adopted throughout the industry. Cutting-edge technologies such as horizontal drilling and multilateral wells are expanding and improving every day. And the means to monitor and measure environmental impact are growing increasingly reliable.



## Smarter Oil and Gas

### Point of view

There is still much work to be done, however. In particular, critical data is not currently shared across tools or processes, either within or between companies. Data analysis also is highly dependent on human interpretation, slowing down the process and increasing the potential for errors. But with the amount of data already being captured, and the vast opportunities and insight that data could provide if it were integrated and analyzed in real time across the industry's global landscape, even small improvements can add up to multi-billion-dollar payoffs.

### The industry imperatives

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

There are three industry-wide imperatives that nearly all stakeholders agree are the keys to building a smarter oil and gas industry:

#### 1) Enhanced 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's been estimated that a single well can generate over 200 DVDs worth of production data daily. But right now, petroleum engineers can spend as much as 60 percent of their time mining 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 the success rates of 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, Repsol's decision to expand its primary, land-based properties into the Gulf of Mexico and offshore Brazil reflected its need to replenish declining reserves. To find substantial reserves, Repsol recognized that its best options lay farther offshore in fields difficult to both 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) Improved 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 material (for example crude and feedstock) and the demand for products requires greater insight, flexibility and responsiveness in refining and manufacturing operations to remain competitive and profitable.

Real-time visibility into operations can help control costs and optimize the performance of assets, facilities and employees, allowing nimble reaction 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, in one instance, if a supplier ship with a particular type of crude becomes suddenly 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 and refine that crude. The end result is no more missed opportunities to optimize for higher margin.

#### 3) Optimize global operations

Few industries are as inherently global as oil and gas. But the challenge of operating an oil and gas company as a globally integrated enterprise remains daunting. A key challenge is sharing operational information, including field, plant, pipeline and logistics data across sites, organizational units and geographies. Oil and gas companies need to ensure they have the right information, seamlessly integrated and without redundancy, to manage the business and its significant asset investments.

## Smarter Oil and Gas

### Point of view

The supply chain is one area companies are increasing visibility and flexibility through sensor-based technologies across the entire enterprise's operations. And through advanced supply-chain analytics capabilities, improved, integrated decision support is helping to optimize global activities.

Already, one oil company is able to simultaneously monitor the flow of oil from more than 100 fields and nearly 50 gas-oil separators, through 11,000 miles of pipeline, into seven refineries and chemical plants—with only two dozen people in one remote location.

### The path to smarter oil and gas

The goal of creating a smarter oil and gas industry is daunting, but achievable. It is accomplished one process, one facility and one company at a time. Through our extensive work with clients in the industry, we have developed a series of steps that, if taken in a logical sequence, can address each of the imperatives discussed above, shortening time-to-value and increasing investment returns. Each step supports the following step and progresses the participant from instrumentation, to integration, to intelligence.

#### Stage 1: Instrumentation and production data capture

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. Instrumentation and data capture can provide real-time, system-wide visibility to better see and understand operations.

#### Stage 2: Data management and integration

Integrate information using standardized upstream, downstream and enterprise data for a cross-functional view. Without proper integration and management of petro-technical data, organizations can severely limit the value of their installed analytical technologies. Valuable information goes unused and key insights are lost. In this stage, the data is set up for easy, rapid access, sharing and analysis, either automatically by applications or by staff employing web-based, front-end portals.

#### Stage 3: Intelligent alerts and event management

Inform operations by monitoring critical performance factors and enabling rapid responses. 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. Workflows can be organized to better leverage the intelligent alerts. Overall, the operation can benefit from greater employee productivity, deeper understanding of critical events and more effective decision making.

#### Stage 4: Advanced analysis and forecasting

This 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, essential to more comprehensive reporting, better forecasting, faster responses and higher quality decisions and actions.

#### Step 5: Asset optimization

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



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Produced in the United States of America  
January 2012

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- 1 U.S. Energy Information Administration, International Energy Outlook 2011, <http://www.eia.gov/forecasts/ieo/world.cfm>. (Sep. 19, 2011).



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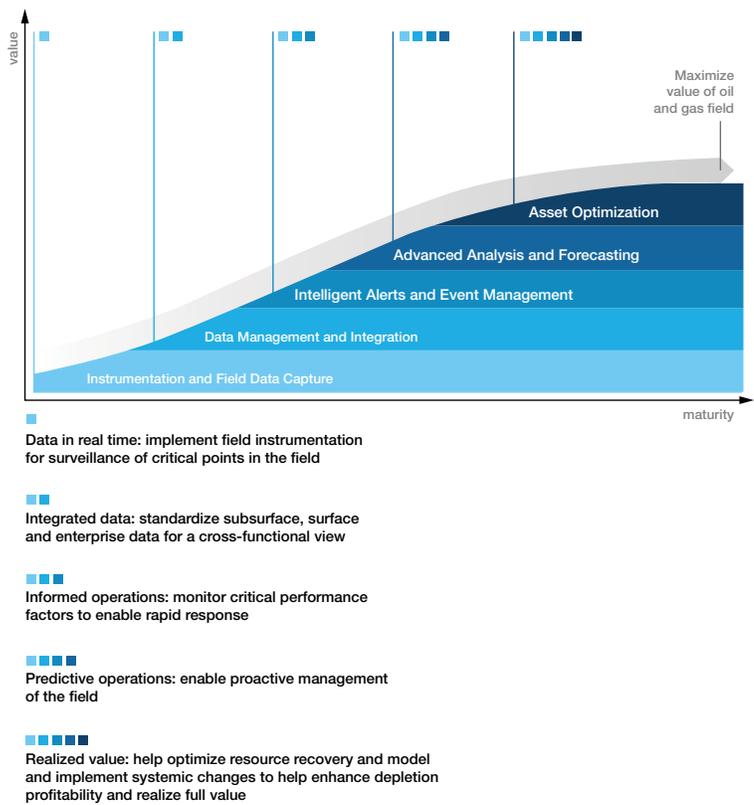


Figure 1: The path to smarter oil and gas.

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 assess the investments required to transform virtually any field. They can estimate the kind of return that is possible from each capability gained along the path.

The oil and gas industry has never been an easy business, and it's not getting any easier. But its importance, and its profile, in today's economy cannot be overestimated. That is why it must transform, always strive to maximize the return on every investment dollar and recover every drop of oil. The degree to which it can do that 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 <http://www-935.ibm.com/services/us/gbs/industries/chemicalspetroleum/>.