Insights on Oil & Gas, September 2008

Energy Downstream Strategies

UPDATE #

Jill Feblowitz Catherine Madden

IN THIS UPDATE

In this update, Energy Insights reviews the landscape for deep- and ultra-deepwater drilling. What new technologies are making deep and ultra-deepwater drilling more economically accessible? We also take a look at a new collaboration between the IT, defense, and the oil and gas industry, including companies such as StatoilHydro, IBM, National Oilwell Varco, Computas, Epsis, TietoEnator, FMC, SAS Institute, and IRIS, to implement a next generation of integrated operations by developing a common digital platform.

Technology Aids Deep and Ultra-deepwater Drilling

Since April 2007, when the price per barrel of oil began to climb and accordingly gasoline prices began an ascent that peaked this summer with an average price of $4.10 a gallon (week of July 14, 2008, Retail Gasoline Historical Prices, Energy Information Administration, U.S. Department of Energy), higher prices at the pump pushed consumers to give greater consideration to our energy resources, or at least the impact on their wallets. In the past few months, there has been an increasingly louder call by both consumers and legislators for the U.S. government to pursue an energy solution that reduces our dependency on foreign sources of oil while increasing our own sources of oil production. The volatile price of oil impacts consumers directly and, more recently, has served as a constant reminder of U.S. dependency on foreign oil sources. This coincides with the struggle of declining production rates at most U.S. reservoirs. As economically accessible reservoirs continue to decline, the need to pursue non-conventional oil sources has increased, including the pursuit of offshore drilling in deep and ultra-deep water.

The upcoming U.S. presidential election in November has also heightened the politics of offshore drilling in the U.S. An executive order had remained in place for the last 18 years that restricted offshore drilling, when in July, President Bush lifted the executive order. At the time, rescinding the ban was rather ceremonial because a congressional ban would need to be lifted to allow for actual exploration. However, the U.S. Congress plans to let the ban on offshore drilling in the U.S. Atlantic and Pacific coasts expire at the end of September. The expiration of the ban is primarily a reflection of party politics and the looming election. However, it's no longer just a

Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.935.4400 F.508.988.7881 www.energy-insights.com

battle among legislators and the industry. What was largely an unconsidered issue for most Americans, the issue of offshore drilling has risen in importance as the American public has initiated a larger conversation on energy resources and the potential consequences of foreign oil dependency.

Regardless of any change in U.S. law on offshore drilling and its potential impact on the landscape for offshore drilling in the U.S. Atlantic and Pacific, there are oil and gas companies that are pursuing deep and ultra-deepwater drilling today. One of the most critical challenges facing the exploration and production (E&P) industry is the depletion of economically accessible hydrocarbons and rising global demand for energy. For deep and ultra-deepwater drilling, economic as well as technology challenges have long been a barrier to exploration. Historically, offshore wells were drilled in just a few hundred feet of water. The advent of 3-D seismic imaging technology allowed for exploration in even deeper waters. Today, new and improved technology is allowing for the pursuit of oil at depths as great as 12,000 feet of water and up to 40,000 feet below the seabed.

Big Challenges – Big Expenditures

There are many challenges facing deep and ultra-deepwater drilling:

- **Deepwater seafloor environment:** This environment can be different for every exploration. One significant challenge is that much of potential deepwater drilling depths are covered by layers of salt, which inhibits deeper seismic resolution.

- **Extreme weather conditions:** Offshore rigs have always needed to be constructed to handle fatigue and stress from extreme and variable weather conditions. However, the rigs needed for deep and ultra-deepwater platforms are greater in size, and need more horsepower and lifting capacity to drill wells at greater depths.

- **Technology challenges:** The capital expenditures are significantly larger for the drilling process in deepwater environments. The major expense in the deepwater exploration is the technological challenges of drilling wells. Deep well drilling poses a number of challenges including an unpredictable base of salt, and rapid pressure differentials, changes in pressure which impact circulation, and ultradeep reservoir includes high temperatures, high pressures, and low natural flow ability.

New Surface and Sea Floor Technologies Can Make Deep and Ultra-deepwater Drilling a Viable Economic Pursuit

New technologies are the key to deep water drilling. Energy Insights sees these technologies as being the most important:

- **Seismic technologies:** 4D seismic technology measures changes in 3D seismic surveys over a period of time. A 3D seismic survey is used to create a computer generated map that shows not only latitude and longitude but depth as well. This information is used

to determine different rock formations that are most likely to contain oil. The use of 4D surveys over time can help monitor movements of gas and fluid underground. These improved images and mapping of the subsea floor are a critical component in determining the location and type of well to drill.

- **Smart well technology:** Technology can play a critical role in well development as it optimizes extraction by actively monitoring and adjusting the flow of oil. Different technologies allow for remote control of wells through down-hole monitoring of wells using variable inflow control valves, pressure gauges, and fiber-optic sensors. The implementation of snake wells, which allow wells to slant, go horizontal as well as turn to allow drillers to hit small pockets of oil or gas in a reservoir. The ability to drill one well to hit several different points in a reservoir can justify the cost of drilling in deep and ultra-deepwater.

- **IT for lean:** Offshore drilling in ultra-deepwater usually requires numerous contractors and suppliers located around the world to coordinate schedules to ensure the appropriate workers and equipment are on-site to launch a project. However, there are often low levels of information and knowledge sharing and collaboration between stakeholders. The implementation of lean processes can include both software and human process re-engineering. These lean processes may include demand forecasting and sales and operations planning, and utilizing statistical analysis to determine the appropriate inventory at a rig.

Recommendations

For energy companies:

- Employing new technological advances in deepwater exploration, drilling and production can reduce the costs of finding and developing new sources of hydrocarbons offshore.

- The implementation of lean engineering processes needs to have a system-wide approach that accesses more than inventory levels.

- Establishing a collaborative and transparent environment between operators, contractors, and suppliers allows for improved communications.

Integrated Operations in the High North – The Right Idea

A joint industry project called Integrated Operations in the High North or "IO in the High North" was launched in August 2008 with DNV, a services firm in the oil and gas industry, as the project manager. The primary objective of this project is to implement a next generation of integrated operations by developing a common digital platform. "IO in the High North" is intended to be a four-year project composed of four year-long phases. The first phase will outline the business and system requirements, system architecture and risk analysis, a complete DPR, MPR and PRODML ontology, as well as a description of an existing infrastructure in the High North.

Pilots for the project include a:

Drilling pilot: Demonstrate an automatically controlled tripping sequence, performed by a drilling control system, which is highly integrated with smart software agents and a dynamic well model for predictive control in real-time.

Production pilot: Develop modular and flexible decision support system to maintain the highest degree of regularity for a remotely operated field in the High North.

Operations and maintenance pilot: Develop solutions and demonstrate that it is possible to operate and maintain oil and gas production facilities in sub-ice conditions.

The project includes collaboration between the IT, defense, and oil and gas industries including companies such as StatoilHydro, IBM, National Oilwell Varco, Computas, Epsis, TietoEnator, FMC, SAS Institute, and IRIS. The total budget of MNOK 90 will be financed by the partners and the Research Council of Norway.

Our View

The oil and gas industry has amassed many terms such as e-field, Smart Field, as well as Integrated Operations for the Digital Oil Field. Ultimately, it's about building a framework through the use of software, hardware, instrumentation, communications, and technology that can aid and improve exploration and production (E&P) activities. In the case of "IO in the High North," the collection of data from offshore to onshore in real time, and converting that data into information that then shapes the technical and organizational objectives is an example of maximizing the return on E&P activities. Energy Insights believes that aligning business processes such as unmanned drilling rigs and optimizing production, with IT initiatives that include a web services platform that supports automatic monitoring, simulation and optimization, as is the case at High North, is the direction needed for

 ©2008 Energy Insights, an IDC Company

pursuing more remote locations and controlling health and safety issues in a challenging environment.

LEARN MORE

Related Research

To learn more, please refer to the following Energy Insights documents:

- *Demystifying the Digital Oilfield* (Energy Insights, Doc # EI202344, July 2006)
- *Exploration and Production – Geology and Geophysics Software* (Energy Insights, Doc # EI206728, May 2007)
- *Western Europe, Utilities Industry, IT Spending, Forecast 2007–2012* (Energy Insights, Doc # EIOS03Q, Sep 2008)
- *Renewable Energy Update: July 7, 2008* (Energy Insights, Doc # EI21307, Jul 2008)
- *U.S. IT Budget Outlook and Spending Forecast by Vertical Market and Company Size, 1Q08 2008* (Energy Insights, Doc # EI212956, Jul 2008)
- *Leveraging IT in Building Green Businesses, June 2008 A complimentary e-book*
- *IT for Green: A Call to Action for the CIO, June 2008 A complimentary e-book*
- *Delivering Best Practices to the Field - Mobility in Refineries, 2008* (Energy Insights, Doc # EI212841, Jun 2008)
- *Energy Trading and Risk Management in the Oil and Gas Industry: The World of $125+-Per-Barrel Oil 2008* (Energy Insights, Doc # EI212678, Jun2008)
- *Worldwide Oil and Gas Industry IT Spending Guide Methodology and Taxonomy, Version 1, 2008 2008* (Energy Insights, Doc # EI212519, Jun 2008)
- *Technology Adoption in Upstream - The Pace Picks Up 2008* (Energy Insights, Doc # EI212130, May 2008)
- *China Oil and Gas Industry IT Solution 2008–2012 Forecast and Analysis 2008* (Energy Insights, Doc # CN38311SQ, May 2008)

Copyright Notice

Copyright 2008 Energy Insights, an IDC company. Reproduction without written permission is completely forbidden. External Publication of Energy Insights Information and Data: Any Energy Insights information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate Energy Insights Vice President. A draft of the proposed document should accompany any such request. Energy Insights reserves the right to deny approval of external usage for any reason.