

Statoil pumps up production levels through information sharing and ‘smart’ practices.

Overview

■ **Business Challenge**

With oil and gas production the backbone of the Norwegian economy, Statoil—the nation’s largest producer—needed a way to offset the natural trend toward declining production levels. Statoil sought to incorporate new technologies into production processes in order to transform, streamline and improve them. Compared with a worldwide average recovery rate of 35 percent, Statoil sought to increase its rate to 55 percent for sub-sea platforms and 65 percent for fixed platforms.

■ **Solution**

To help in this effort, Statoil teamed with key industry players IBM, ABB, Aker Kværner and SKF to create a new process framework that links advanced realtime sensing capabilities in the field to powerful, collaborative and analytical resources accessible across the enterprise. Together with other initiatives, the solution will contribute to Statoil’s efforts to increase the recovery rate of its existing oil and gas fields, thereby adding tens of billions of dollars in oil revenues.



Statoil is an integrated oil and gas company based in Norway with 25,400 employees and activities in 31 countries. The group is operator for 60 percent of all Norwegian oil and gas production, and is one of the world’s largest sellers of crude oil. Statoil is also a major supplier of natural gas in the European market and has substantial industrial operations.

■ **Key Benefits**

- *Expected 5 percent annual increase in oil and gas production through reductions in unplanned equipment downtime*
- *Expected 30 percent reduction in costs through the use of predictive maintenance practices*

Every year, organizations like the World Bank compile a list of nations with the highest gross national income per capita, a key indicator of a nation’s standard of living. And every year, Norway is listed near the top of this list, alongside countries like Luxembourg, Switzerland and the United States. Underpinning Norway’s high standard of living are vast oil and gas reserves lying under its continental shelf, beneath the frigid waters of the North Sea.

Optimizing oil and gas production through “smart” practices and collaboration

Business Benefits

- Expected 5 percent increase in oil and gas production through planned and improved maintenance processes
- Expected 30 percent reduction in costs through the use of predictive maintenance practices
- Extension of oil field life and increase in production yield through “smart” field management, enabled by realtime wireless sensing of subsurface oil field installations
- Lower costs and improved production efficiency through the consolidation of well monitoring and management into onshore facilities
- Increased interdisciplinary collaboration through improved information sharing

“Our efforts to bring more integration and collaboration to our production processes are critical to the future of the offshore industry. IBM has shown a strong commitment to helping us achieve this goal.”

– Adolfo Henriquez, head of Integrated Operations, Statoil

Its oil resources are, in fact, so abundant that Norway ranks behind only Saudi Arabia in oil exports. With 25 percent of its economic activity associated with the oil and gas industries, the fortunes of Norway’s economy have become closely entwined with the health of these industries. In the time since North Sea oil was first discovered in the late 1960s, Norway’s 4.5 million citizens have enjoyed a steady increase in prosperity.

Oil and gas producers are faced with many challenges in their efforts to increase recovery rates and extract more out of the remaining 50 percent that is left in the oil and gas bearing reservoirs of the North Sea. In April 2006 the Norwegian Oil Industry Association (OLF) published a report stating that if the oil and gas companies on the Norwegian continental shelf were to quickly integrate their operations by advanced use of information and communication technology they would increase their revenues by US\$41.5B. If they did not integrate their operations, they would risk losing US\$10B in potential revenue within the next three years.

These rather dramatic figures have caused an entire industry to consider new measures in order to integrate their operations and reverse the decline in North Sea production rates and to extend the lifespan of its existing oil and gas fields. As the nation’s largest producer—accounting for 60 percent of all Norwegian oil and gas production—Statoil (www.statoil.com) has been a key catalyst for this change.

Taking control

To address the challenges stated in the report, Statoil initiated the TAIL-Integrated Operations project with key industry partners IBM, ABB, SKF and Aker Kværner, with the goal to identify the methods, technology and work processes needed to integrate its operations. As the name implies, TAIL IO is aimed initially at improving operations at fields approaching the end of their lifetime. The widespread use of advanced information and communication technology was only part of the equation to reach the estimated potential. The implementation of new work processes based on real-time access to data, in addition to organizational changes of moving functions and personnel from costly offshore oil rigs to onshore locations, was equally important.

Statoil and the consortium members are each contributing equally to the project in terms of resources and input. The company turned to ABB, Aker Kværner and SKF for their extensive engineering and energy expertise, and to IBM for its ability to apply innovative insight and open standard technology to drive efficiency improvements. A key part of IBM’s mission in this consortium is to bridge the gaps between different parts of Statoil’s operation so that data and employee knowledge can be leveraged across all processes.

For Statoil, having to operate with independent “islands” of corporate knowledge has been more than just a metaphor, since its offshore platforms have long operated independently of one another. This means that even though a group of platforms may be gathering subsurface data on the same underlying oil or gas field, they nonetheless have been unable to combine their information into a more comprehensive view of the field. To bridge this gap, IBM is extending WebSphere® integration software with manufacturing domain adapters and an integration industrial-semantic model based on a linkage of key oil and gas standards to create a flexible information integration and interoperability framework. When implemented, this will allow Statoil to aggregate its collective knowledge across rigs and fields, thus creating a foundation for more informed decisions, optimized processes and – ultimately – higher production efficiency. Within this framework, IBM WebSphere Enterprise Service Bus is a standards-based integration broker within a service-oriented architecture environment – a crucial factor to enable the flow of information through the company’s IT systems, regardless of its format, and make it accessible where it’s needed most.

Decision-making in four dimensions

IBM is also providing the key elements required for Statoil to implement “smart” field management practices. Using data from wireless sensors, which monitor subsurface conditions (such as the pressure and temperature at different points in the field, as well as the movement of gas or oil deposits within the field), the solution will provide Statoil’s engineers with the information they need to know when, where and how much to pump. By combining information from all of its production facilities, Statoil will gain a much more comprehensive view of the state of its oil fields, vastly improving its ability to optimize its extraction activities. When the ability to visualize subsurface conditions in three dimensions was first introduced, it represented a major innovation in oil production. As embodied in the IBM solution, Statoil’s vision of smart field management pushes that notion even further by adding a fourth dimension – time. Getting data feeds from its sensors in real time will give Statoil the means to make decisions for production optimization on the spot, without having to wait weeks or months to gather and synthesize information. This can make a crucial difference in maximizing a field’s production yield.

The solution’s framework for integrating information and business processes is also the key enabler of Statoil’s preventative maintenance strategy, which is designed to identify potential maintenance issues before they become critical and cause shutdowns. Wireless sensing and telemetry technology combined with IBM Information Server software helps Statoil derive more value from the complex, heterogeneous information spread across its systems.

Key Components

Software

- IBM WebSphere Enterprise Service Bus
- IBM WebSphere Process Server
- IBM WebSphere MQ
- IBM WebSphere Application Server
- IBM Information Server

Services

- IBM Global Technology Services
- IBM Global Business Services
- IBM Research

Timeframe

- Planning and testing: 1 year

Why it matters

While modest recovery rates have been seen as fact of life in mature oil and gas fields, Statoil saw Norway’s economic reliance on petroleum production as an incentive to “rewrite the rules” on production efficiency. Statoil teamed with an industry consortium that includes IBM, ABB, Aker Kværner and SKF to combine advanced sensing technology with integrated operations to optimize the management of its oil and gas fields – contributing to production improvements that will yield tens of billions of dollars for the Norwegian economy.

The solution will gather information on asset conditions, such as the thickness of a pipe, from all of its platforms and facilities. Algorithms developed by IBM Research will process this data to determine when proactive, or “condition-based,” maintenance should be performed. For Statoil’s production engineers, IBM Research developed similar well-algorithms that analyze the subsurface data gathered by sensors to provide the decision support needed to optimize field production.

Collaborating offshore and onshore

While the IO initiative is in many ways about bringing information and processes together, it’s also about bringing them onshore. The combination of the harsh platform life, the steady aging of its workforce and the increasing challenge of keeping up the work continuity, threatened Statoil with a staffing crunch and, perhaps more importantly, the loss of valuable human capital as experienced workers retired. By leveraging the process integration enabled by IO—as well as advanced wireless sensing and communications technology like RFID—the consortium is helping Statoil migrate key processes from its platforms to its onshore facilities. In making its processes less location dependent, Statoil will gain a whole new level of efficiency and flexibility in the way it deploys its personnel. By stemming the outflow of experienced workers, this new service paradigm helps Statoil preserve its valuable assets—its employees’ knowledge.

Statoil expects the TAIL IO projects to identify ways to increase its overall production by 5 percent—an enormous margin in the realm of offshore oil and gas drilling. What’s more, by enabling the proactive maintenance of its facilities, Statoil expects to reduce its operating and maintenance costs by 30 percent. By moving from a scheduled maintenance process campaign to a proactive and preventative maintenance model, Statoil expects a drastic reduction in shutdowns and the effects they produce—such as expediting costs and long delays. This model will also help Statoil to optimize turnarounds and shutdowns across all assets.

Adolfo Henriquez, head of Statoil’s Integrated Operations, believes that IBM’s insights will play a critical role in the success of the IO project. “Few companies have the combination of technology expertise, leading-edge research and industry knowledge that IBM has displayed in its engagement,” says Henriquez. “Our efforts to bring more integration and collaboration to our production processes are critical to the future of the offshore industry. IBM has shown a strong commitment to helping us achieve this goal.”

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