

Integrated operations

Creating the oil company of the future
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An ABB-led research and development consortium is helping Statoil develop technologies and work processes that will enable one of the world's leading oil and gas companies to operate seamlessly and in real time across organizational and geographical borders and make safer, better and faster decisions.

Known as "TAIL – Integrated Operations," the project will identify ways to increase daily production by 5–10 percent, reduce operating and maintenance costs by 30 percent, cut unwanted incidents related to health, safety and the environment by half, and develop technologies, processes and expertise that will extend the productive life of Statoil's oil and gas fields.

In April 2006 the Norwegian Oil Industry Association (OLF) published a report on the "Potential Value of Integrated Operations on the Norwegian Shelf." [1] The report found that if oil and gas companies active in the Norwegian shelf were to quickly integrate their operations, they could increase their revenues from the shelf by \$41.5 billion. If they do not, they can expect to lose out on \$10 billion in potential revenues within the next three years alone.

These are staggering figures that reflect an array of challenges the industry faces and the scale of the prize at stake. Although the prescribed solution to these challenges goes under different names – Integrated Operations (Statoil), eOperations (Hydro), Smart Field (Shell), Field of the Future (BP), and i-field (Chevron) – the key elements are broadly the same: the widespread use of advanced information and communication technology (ICT) and real-time data; the introduction of new work processes based on real-time access to that data; and or-

ganizational change, in particular the migration of functions and personnel from costly offshore sites to consolidated onshore locations.

By integrating their operations on the Norwegian shelf, the report concludes, oil and gas companies will be able to accelerate and increase production, reduce operating costs, improve safety and extend the life of their oilfields.

Statoil appoints ABB

Statoil **Factbox 3** defines integrated operations (IO) as “collaboration across disciplines, companies and organizational and geographical boundaries, made possible by real-time data and new work processes, in order to reach safer and better decisions – faster.” To help identify the methods, technologies and work processes necessary to integrate its operations, Statoil appointed ABB **Factbox 2** to lead an R&D consortium consisting of IBM, SKF and Aker Kvaerner **Factbox 1**.

The project, known as “TAIL – Integrated Operations” was started in January 2006 and assigned the following targets:

- Increase daily production by at least 5 percent by reducing production losses caused by operational failure, maintenance stops and inadequate equipment performance
- Reduce operating, construction and maintenance costs by 30 percent
- Reduce the number of unwanted incidents relating to health, safety and the environment (HSE) by 50 percent
- Extend the lifetime of Statoil’s oil and gas fields.

The consortium and Statoil are each contributing equally to the project in terms of input and resources. In addition, the Norwegian Research Council is a major contributor to the funding of the project, which has a budget of \$24 million and will run for a period of three and a half years.

Statoil’s extensive assets

Statoil produces 1.1 million barrels of oil equivalent (BOE) a day and is the world’s third largest net seller of crude oil. It operates 25 offshore installations, some 6,000 km of pipeline, and onshore facilities and terminals in five European countries along the North Sea rim **1**. Statoil is also one of the world’s most environmentally efficient producers and transporters of oil and gas, and is consistently ranked by the Dow Jones Sustainability World Index as the world’s best oil and gas company in issues of sustainability.

The implementation of IO across these assets requires both short- and long-term strategies. In the short term, the focus is on making improvements in daily operations and maintenance. These range from establishing support centers onshore, improving existing work processes, training staff in IO and cross-border cooperation, and investing in ICT to make real-time collaboration possible. An essential component of the process is the involvement of suppliers and external resources to support facility maintenance and operation.

In the long term, investments in new technologies, work processes and competence will be necessary to make the transition to an IO company successful.

As its name suggests, TAIL-IO is aimed initially at improving operations at fields approaching the end of their lifespans.

Statoil is highly dependent on contractors and suppliers throughout the value chain to achieve its short- and long-term objectives. The traditional R&D model for asset management rarely involves suppliers and external competence in an optimal way. To rectify this, Statoil initiated a new partnership model with leading suppliers, the result of which, in the field of asset management, is the contract between Statoil and the ABB consortium.

The R&D collaboration model is an IO initiative in its own right. It requires cooperation between different companies, cultures and functions (R&D and business units), as well as joint management and the use of a gate process¹⁾ for project control. Even more importantly, the lessons learned from the partnership will demonstrate how Statoil and its leading suppliers create value by allowing their best R&D resources to collaborate in an environment without borders. Collaborative research is about common objectives, it is about trust and it is about working with meaningful targets.

From the consortium’s point of view, the project is a unique opportunity to get customer feedback at a very early stage of the R&D process. This enables ABB and its consortium partners to

1 Statoil production sites



Footnote

¹⁾ See also p. 12 of this edition of *ABB Review*.

Automation collaboration

focus on real customer needs. It also ensures that the technologies and methods developed are validated in pilot installations in an operational environment.

With each R&D team composed of representatives from all five partner companies, the project offers team

members the opportunity to experience and learn from different R&D cultures and to exchange knowledge and know-how. TAIL-IO is an ideal opportunity for the consortium to develop the oil technologies of tomorrow in cooperation with a leading end-user like Statoil, and to field-test new concepts and technologies before taking them to the global market.

Factbox 1 Consortium members

IBM

IBM is the world's leading supplier of middleware and the second largest software company overall. It is the leader in business consulting, with more than 3,000 oil and gas professionals worldwide, and has the world's largest industrial research organization, with some 3,400 employees and eight research laboratories worldwide. Group revenues in 2006 were \$91.4 billion.

SKF

SKF is a leading supplier of products, solutions and services in roller bearings, seals, mechatronics, services and lubrication systems. Its Reliability Systems business unit provides value-adding systems, software and consultancy in machinery reliability. Group revenues in 2006 amounted to \$7.7 billion

Aker Kvaerner

Aker Kvaerner is a leading global provider of engineering and construction services, technology products and integrated solutions in oil and gas, refining and chemicals, mining and metals, and power generation. Group revenues in 2006 were \$8.4 billion

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Tail-end production

As its name suggests, TAIL-IO is aimed initially at improving operations at fields approaching the end of their lifespans. Tail-end production is a major challenge facing all oil and gas companies. It is the stage where the production rate is declining, the facilities are aging, and the cost of operation is high. Extending the economic lifetime of these fields is vital to all companies, especially those operating in the Norwegian shelf.

TAIL-IO is divided into six subprojects, also known as technology areas. Each technology area is closely linked

with the others and collaboration between them is encouraged **2**.

1. Condition-based maintenance and performance monitoring

The objective is to create a condition monitoring portal that will contain plant condition data on all critical subsea and topside equipment, and support work processes at IO centers. The project will develop methods for early fault detection and residual life prediction and for condition monitoring of critical assets like pumps, valves and electrical, rotating and static equipment.

2. Corporate decision support model for strategic planning of turnarounds and shutdowns

The goal is to develop a tool that can accommodate a vast and complex range of data with the ultimate objective of eliminating asset shutdowns.

3. Wireless communication and sensor systems

Among the objectives are the design of new and open communication systems, the installation of wireless instrumentation to reduce cabling and capital expenditure, and the automation of maintenance tasks to reduce maintenance man-hours.

4. Collaborative visualization tools for preparation, training, executing and supporting maintenance operations

The aim is to develop a tool that can support a wide range of functions (including multi-organizational team collaboration) to perform maintenance operations and diagnostics and improve the level of assistance from centers of excellence.

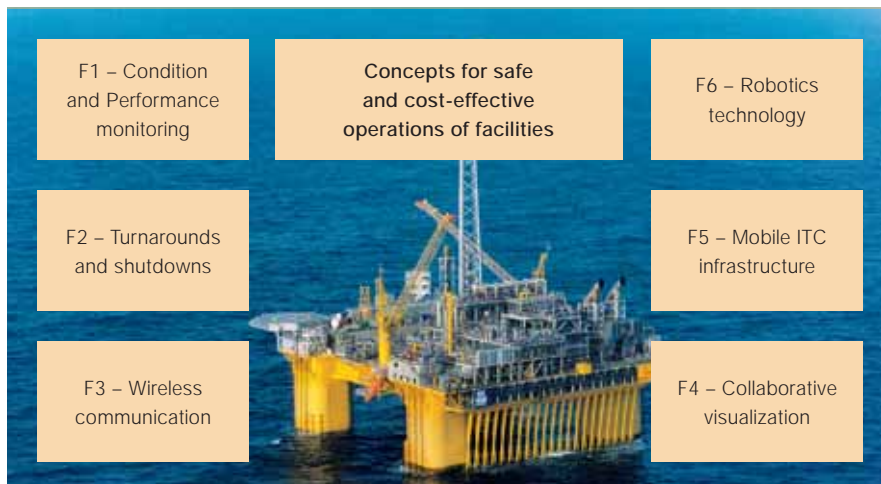
5. Mobile ICT

The focus is on man-machine technology, work processes and mobile ICT infrastructure that support plant personnel. The growing deployment of wireless networks and devices is increasingly making it possible for maintenance technicians to have continuous access to support systems and personnel via a wireless connection and PDA (personal digital assistant).

6. Robotics

The sixth subproject concentrates on robotics technology to supplement

2 Subprojects of the TAIL – Integrated Operation



Factbox 2 ABB and Statoil

ABB and Statoil have a long and close relationship that goes back many years and encompasses most segments of the oil and gas value chain.

Troll A – one of the world's largest natural gas fields – is powered by two unique ABB technologies: HVDC (High Voltage Direct Current) Light and Very High Voltage Motors. This, the world's first power-from-shore solution, enabled Statoil to increase capacity by 25 million cubic meters of natural gas a year and reduce annual CO₂ emissions by 230,000 tons (left).



Snohvit gas field and Hammerfest gas liquefaction plant (right) are equipped with a complete and fully integrated ABB automation, safety and electrification system. This will enable Statoil to operate and monitor the subsea installation from one onshore location and achieve an energy efficiency level unmatched by any other LNG (Liquefied Natural Gas) facility worldwide when production commences in late 2007.



and extend human inspection and intervention capabilities at subsea, topside and onshore facilities. The objective is to develop solutions that combine tele-robotics and advanced visualization to enable remotely operated inspection and maintenance operations, as well as to identify and close technology gaps.

Creative collaboration

Establishing a project culture that nourishes creativity and innovation is a concern when so many partners and

interests are involved. To add to the complexity, a large number of external research institutes are also taking part in the project (TAIL-IO is currently hosting five PhD students and five postdoctoral candidates).

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The creativity factor has been solved by providing researchers with a supportive and challenging environment conducive to sustaining high levels of creativity in individuals and teams. By offering researchers a variety of challenges with respect to technology, work processes and collaboration – and the possibility to follow the R&D process from idea generation to pilot

installation – the TAIL-IO project is already proving a success.

Openness and the sharing of new ideas is likewise a challenge. To ensure that good ideas are not held back and that the originators get the credit for their ideas, a system for registering invention disclosures has been established. The objective is to translate those ideas into solutions, turn successful pilot installations into Statoil assets and, for the consortium members, release the technology into the global marketplace.

Pilot rollout

TAIL-IO is now entering the phase of pilot rollout, with a number of technologies and solutions ready to proceed to the pilot stage. For instance, extensive testing of wireless technology for industrial environments has taken place in the laboratory and is about to be piloted at several Statoil sites. A large-scale robotics test rig is ready for installation at an ABB laboratory, and several condition and performance monitoring technologies that enable access to data independent of location – true IO enablers – are due to be piloted. The proof of the success of these and other technologies and solutions developed in the TAIL-IO project will come with their eventual deployment over a wide range of assets and installations.

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References

- [1] The Norwegian Oil Industry Association (2006) Potential Value of Integrated Operations on the Norwegian Shelf.

Factbox 3 Statoil

Statoil is an integrated oil and gas company and the leading operator on the Norwegian continental shelf. With exploration and production activities in 15 countries, Statoil is one of the world's largest suppliers of crude oil and a substantial supplier of natural gas to the European market. Revenues in 2006: \$ 71.7 billion