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StatoilHydro  ABB  SKF  Aker Kvaerner  IBM
Dear reader,

TALIO has been in "production" since January 1st 2006 and has a lot of exciting results on its way in the pipeline. It is great to see how cross company, cultural and cross discipline teams collaborate to create results together. This is TALIO in the true spirit of integrated operations.

We have a dedicated team committed to deliver first class innovations to support StatoilHydro in achieving their overall goals for extending the lifetime of StatoilHydro's oil and gas fields.

- 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)

For those of you that have the opportunity to visit Technoport in Trondheim 18-20 October, see us at stand F4, "Samarbeid i praksis" where you will get a better understanding of what TALIO is all about.

We hope that you will enjoy the reading and perhaps get a better understanding of what TALIO is all about.

Mona Svenes
Svein Vatland
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Statoil defines integrated operations (IO) as collaboration across disciplines, companies, 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 a R&D consortium consisting of ABB, IBM, SKF and Aker Kvaerner.

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 NOK 204 million and will run for a period of three and a half years.

As its name suggests, TALIO is aimed initially at improving operations at fields approaching the end of their life-spans. TALIO is a major challenge facing all oil and gas companies. It is the stage where the production rate is declining, the facilities are ageing, 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 Continental Shelf. However, most of the solutions developed in TALIO will also be applicable for green field installations.

TALIO is divided into seven sub-projects, also known as technology areas. Each technology area is closely linked with the others and collaboration between them is encouraged.

The purpose of the TALIO newsletter is to share some of the challenges and results achieved in the TALIO project with a broader audience. We hope that you will enjoy the reading and perhaps get a better understanding of what TALIO is all about.

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The collection of real-time information about production, equipment and performance status from processing and operational units across the organization is a critical success factor to achieve completely integrated operations.

Integrated Operations (IO) is enabled through monitoring of real-time data. Real-time or historical data collected at the plant floor must be made available in control rooms, in collaboration rooms like operational centres, and to managerial functions with responsibilities related to production operation, well operations, maintenance, and logistics. Through a closer integration of data from control and monitoring systems with the overall information system solutions, support of corporate as well as plant-specific work processes and goals is optimized. A critical success factor for the IO concept is a closer relationship between the industrial IT and the enterprise IT and administrative domains.

- The real-time information must be collected across the organization from any oil field or plant and made accessible for analysis and comparison. We have all this data, but we need to structure it to support a common architecture foundation for enterprise-wide integration to also include enterprise domains. The real-time solution extends the standardized common integration architecture across TAIL and eventually across all Statoil facilities through a carefully chosen set of test cases.

- The project task is to strengthen the integration of sea and land-based activities, a task hosting many challenges. To achieve this goal we have developed solution components based on requirements from data that is piped through the TAIL F0 project. This solution will enable the integration of real-time data from the control- and operational systems with the administrative systems like SAP and PROSTY, allowing the processing and operational units to establish new flexible business solutions with seamless access to information and services across the corporation, says Frode Myren, consortium sub-project manager for the F0 Common Architecture project, and leading the architecture development across the various subprojects in TAIL for IBM.

- The real-time information integration project in detail

The TAIL F0 project is piloting a common Real-Time Integration Solution, planned to support a common integrated architecture across TAIL and eventually across Statoil facilities and enterprise domains. The subproject started in January 2007.

The key components of the solution are based on SOA products. The initial solution aims to integrate real-time and historical data for operations and maintenance at the Statfjord A and Gullfaks B facilities through a carefully chosen set of test cases.

This pilot will verify that information from both facilities can be uniquely accessed, processed, and visualized through the same applications and services, by using standardized and flexible information structures. The pilot is being installed on test systems in Stavanger, and will access real-time data historians at both facilities. The information integration model, Reference Semantic Model (RSM), is adding value to the standardized common integration service already acquired by Statoil, the Enterprise Service Bus, which facilitates new levels of flexibility and reuse of information and services.

Common practices for the entire industry in the TAIL IO project, all the subprojects target specific essential IO concepts for safe and cost-efficient operation of facilities. The real-time solution extends the enterprise-wide integration to also include a common architecture foundation for operations and maintenance, thus providing common information integration models for the entire oil and gas industry. To facilitate the adoption across the TAIL projects, and subsequently Statoil, the F0 project also targets the establishment of an architecture governance model and additionally an Integration Competency Practice, providing guidance and expert resources.

What we do is strengthening the integration of sea and land-based activities

Verification and fine-tuning of the integration practice will be carried out through testing of the architecture at the Statfjord/Gullfaks, and also through integration of the other TAIL projects, for example at the Snøhvit facility. The final specifications of the application for the Common Architecture and the Real-time Integration Solution will then be completed, with subsequent proposal for implementation and rollout.

Business benefits

Important business benefits are being targeted: lower operation costs and accelerated production through faster rollout of new operations, maintenance processes and applications across Statoil’s various assets, and also faster standardization of processes and applications. Further advantage is expected from reduced implementation and standardization costs.

There are practically no changes required to operating assets, therefore replacement costs are minimized, says Frode Myren. The information is accessed directly at its source, ensuring that information is correct and up to date. We also expect to see a considerable efficiency improvement by eliminating many complex, expensive and time-consuming interfaces, he continues.

The project also targets improved coverage of offshore operations through a common approach to real-time monitoring and control across all facilities. The F0 approach supports Statoil’s strategy for deployment of new value adding IO solutions.
sub-project F1. Condition and performance monitoring focuses on condition and performance monitoring of critical subsea and topside equipment. The objectives of the project are to review and develop systems, methods, and work processes to enhance and improve condition-based maintenance in Statoil. The project includes participants from Statoil, ABB, SKF, Aker Kværner, and IBM and is managed by Statoil and ABB.

Effective lifecycle management requires continuous tracking of asset history when it comes to operation, wear, damage, and maintenance. Careful monitoring of the condition and performance of assets allows the implementation of predictive maintenance programs that might significantly reduce maintenance costs and risk of asset failure. Without this information, performance suffers and maintenance costs rise.

The F1 project group is working on several solutions that focus on condition and performance monitoring, in the following some examples of ongoing work is presented.

**Drive Monitor**

The Drive Monitor is designed for remote monitoring of variable speed drives, and is intended for use together with ABB drives. Several parameters are available from the drives, these include shaft torque, phase current and phase voltages. These data - as provided by the drive unit and analyzed by the Drive Monitor - can return valuable process status information regarding process condition, process drift and changes. The information will be extracted and calculated without requiring any extra instrumentation, as it is based on parameters contained in the Drive unit.

A main goal for the project is to demonstrate how the Drive Monitor can be accessed from remote locations in a safe and efficient way. This enables experts located anywhere on the globe to get access to the information in the drive monitor upon demand. E.g in a fault situation, Statoil personnel and experts from ABB are able to do real-time analysis and corrective work without being physically located where the drive is. This is truly integrated operations and will surely lead to reduced meantime to repair.

The pilot installation is at Kollsnes and has just been put into operation and testing is currently going on.

**Early Fault Detection**

This is another area of focus for the project group. Despite the term fault detection, we are concerned with every aspect of performance monitoring: process malfunction, instrumentation degradation, suboptimal process behavior, and internal or external disturbances. A special focus is on early detection, meaning that we will try to identify trends at an early stage, where they are otherwise difficult to observe. We want to give a warning of what may become a problem days, weeks, and even months ahead.

The topic early fault detection includes a chain of challenges such as: data acquisition, methods and techniques, work processes and user interfaces. The work on early fault detection includes the following activities:

**EFDD – Early Fault and Disturbance Detection:**

The project goal is to develop a software tool that will provide data driven methods for process modeling and analysis, based on both time and frequency domain techniques - originating from Statoil and ABB, respectively. Methods are being verified against field data from Åsgard B.

**EEW – Event Early Warning:**

This is based on IBM’s patented EEW technology. The approach is based on identifying patterns and logical dependencies in the data. A potential pilot is on the detection of malfunction and performance of the separators on Heidrun.

**Data acquisition:**

Both the above approaches rely on the availability of historical and real-time data for configuration and analysis. Data access is a serious bottleneck that is responsible for a lot of wasted time spent on solving a number of practical problems before we can start the real work on diagnosing the process. Our ultimate goal is to provide means for instant access, at any time, anywhere, to all process variables; with maximum resolution and accuracy, and for the total lifetime of the process.

The intention is that the data is to be made available to Statoil’s partners. Challenges related to this are access time, visualization, and anything that has to do with handling very large data sets in general. The solution is ready to be tested against Åsgard B.
Statoil regularly has to close down the production on its oil & gas fields, due to preventive and corrective maintenance activities, modifications of the plants, and tie-in of new fields. In 2006, turnarounds and unplanned shutdowns were the single-most important cause for lost production in the Tampen area. Statoil has launched several initiatives to minimize production losses due to turnarounds and reduce the probability of unplanned shutdowns.

To support these initiatives, Statoil R&D and the TAIL IO projects along with Tampen have launched a joint project for development of work processes, methods and solutions for improvement. The solutions will improve Statoil’s ability to:

- Monitor the progress of ongoing turnarounds according to WR2091: “Management and planning of turnaround projects” and assess consequences on turnaround performance and possible delays in production start up.
- Prolong the intervals between turnarounds and reduce the duration of future turnarounds without increasing losses due to unplanned shutdowns.
- Optimize turnarounds and shutdowns across assets that are dependent on each other.

- The project is part of the TAIL IO initiative, explains Statoil’s project manager Tom-Anders Thorstensen. - In addition to Statoil R&D and Statoil Tampen, IBM and Aker Kvaerner actively participate in the project, which is managed by Statoil and IBM. - IBM has also allocated optimization experts from its R&D lab in New York to the project, Thorstensen continues.

- Development of the solutions is well on its way, says IBM’s project manager Kaare J. Finbak. In April the project delivered the first prototype and now pilots of the solution for monitoring of ongoing turnarounds are being tested out by the Tampen organization.

The work processes, methods and solutions developed will consist of three main building blocks, i.e., a turnaround and shutdown knowledge analyzer, a turnaround and shutdown risk analyzer and a turnaround and shutdown optimizer.

Knowledge analyzer

The knowledge analyzer will provide tools for continuous monitoring of the progress of ongoing turnarounds, monitoring of shutdown preparedness, reveal possible delays and evaluate the consequences of delays on production start up.

Risk Analyzer

The risk analyzer will offer tools for real-time evaluation of various turnaround scenarios for a specific oil and gas field, and selection of the scenario that has the overall lowest production loss.

Optimizer

The optimizer will contain tools for “on-the-fly” development of turnaround scenarios across assets, and identify the scenario that produce the best result in minimizing production losses.

Such tools do not exist in the market today. The work processes, methods and tools will provide a round-the-clock monitoring of all turnarounds and report on shutdown preparedness. Operators will be able to receive real-time evaluation of any delays expected for ongoing projects, or any adjustments or modifications carried out to scheduled plans, in addition to receiving continuous updates on optimization of turnaround scenarios, either as specific assets or across assets.

The overall objective of this TAIL IO project and Statoil R&D is through usage of the new processes, methods and tools, to improve PUF significantly and to lower turnaround and shutdown costs.

As stated by Sven Tømmerås, discipline advisor for O&M planning: “The economical potential of the project is believed to be significant. We believe it is very important that WR2091 is fully implemented throughout the entire Tampen organization, and that we have effective support and control tools that enable us to meet our regularity (PUF) and production targets.”

The projects was initiated early 2006, and will continue until January 1, 2009.

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The project presented this work at an inclusive one-day “Wireless Technology” seminar held at Rotvoll in March 2007 which was attended by representatives from the consortium, and many Statoil assets. Furthermore, parts of the technical results from the laboratory pilot have been published at the IEEE Emerging Trends in Factory Automation conference in September 2007, and have been accepted for presentation at the SPE Intelligent Energy Conference to be held in February 2008.

In March 2007, one of the laboratory pilot test rigs was exhibited at ABB’s Automation World in Orlando, Florida. This rig illustrates the potential value of replacing wired fieldbus segments with wireless in a control network. The rig will be exhibited, among other F3 prototypes, at Technoport in October 2007.

In conjunction to the laboratory-based work, the F3 project has also visited Kårstø and Kollsnes onshore facilities to conduct a “Wireless Evaluation” study for each site. The goal of the studies was to identify and evaluate areas where wireless technology would benefit the sites in terms of improved production and HSE. The project is planning to conduct its first offshore evaluation study in November 2007.

Looking to the future, F3 are working closely with both onshore and offshore facilities to promote the use of wireless technologies in pilot installations. We are continuing to educate with a further seminar planned in Q4 2007. Furthermore, we are embarking on an exciting research project to develop the Wireless Field of the Future which will combine different aspects of wireless technologies, pervasive computing and novel applications.

Imagine an environment where wireless sensors can be quickly deployed to provide measurement points as required. Imagine an environment where field operators can wirelessly access real-time process data, stream voice and video, configure and calibrate their instruments. Imagine an environment where equipment can be quickly and easily located and identified. Believe in wireless…the TAIL IO F3 Wireless Communication project does.

The TAIL IO “Wireless Communication” (F3) project aims to test, evaluate, and apply wireless technologies for Oil and Gas applications. The initial phase of this 3.5 year endeavor was based at Statoil’s research laboratory in Rotvoll which provides a quasi real-life environment with large multifaceted metal structures and flowing liquids. In 2006, a team of international experts from Norway, Ireland, Scotland, Wales, Holland, and Sweden representing ABB, Statoil, SKF, and Sintef worked together with the Rotvoll scientific and laboratory staff, to undertake an extensive wireless evaluation pilot. The goal was to evaluate a variety of technologies which can deliver the following three key results to Statoil installations:

- Improved HSE
- Increased Production
- Lower Costs

Technologies that were identified by the F3 project team, through scouting and discussions with Statoil operations personnel, as crucial to the successful delivery of the above results include: Wireless Sensor Networks, WLAN, Wireless Vibration Monitoring and Analysis, Wireless Control and RFID. Range, throughput, reliability, availability, stability, security, and interference testing was given special emphasis at the laboratory.

We are embarking on an exciting research project to develop the Wireless Field of the Future. Contact Info:

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A day in the life of Bjarne

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Can you tell which one is the real one?

F4 - Collaborative Visualization in Practice

F5 - Industrial Collaboration Yields Results - Wireless solution for Automatic Testing of Fire & Gas Detectors

The objective of the TAIL F5 sub-project is to "Bring the Field Worker Office to the Plant". 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 device.

An "example of the faceplate on the PDA"

Wireless solution for testing fire and gas detectors on Statoil's Snøhvit field is being launched. The "Fire & Gas" solution is an innovation from the TAIL ID F5 project group, working with wireless solutions on handheld units to bring the field worker office out to the plants. This entire operation is carried out in real-time.

The solution suggests improved safety and efficient procedures, yielding great savings for the industry.

The solution is a typical collaborative maintenance scenario. By using modern technology in 3D visualization and collaboration, maintenance and work processes carried out offshore can be done smoothly and efficiently, thereby preventing serious situations or shutdowns to occur.

The objective of the project is to develop means of visual collaboration on the basis of the 3D design models of plants and installations. The visual collaborative arena is an interactive 3D-viewer presentation of the actual assets.

The scenarios could be as follows:

- Multi-organisational design teams collaborating in the design and modification phase
- Multi-organisational teams collaborating to perform maintenance operations
- Preparation and training for the most efficient and effective maintenance package
- Capability for remote diagnostics and remote assistance from Centres of Excellence
- Capability to integrate with specialist services easily and without disruption, regardless of the source (in-house or external)
- Learning based improvement loops for execution of work processes (maintenance workflows) and training personnel on HSE

A virtual presentation of the assets in a 3D virtual environment on a gaming platform gives a new dimension to the collaborative and interactive way of information sharing, managing and performing work processes.

The solutions benefit from the implementation of the Fire & Gas solution on Statoil's Snøhvit field is increasingly making it possible for maintenance technicians to have continuous access to support systems and personnel via a wireless connection and PDA device.

The results and lessons learned will form the basis for further commercialization of the solution.

These people can be contacted for further details regarding the solution:

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Example of the faceplate on the PDA.
Asset Tracking, based on RFID technology, will help operating companies and suppliers trace their assets shipped in containers to plants offshore.

With the new wireless Asset Tracking solution from theTAIL.IO F5 group based on RFID technology, developed in collaboration with researchers at IBM, the oil and gas industry has found the answer to tracking and locating equipment from when it is dispatched by suppliers until the equipment is delivered and assembled on offshore installations. This helps supply stations onshore receive cargo and load it onto containers being shipped to offshore installations.

The F5 project group will design a new solution for offshore logistics based on RFID technology, developed in collaboration with researchers at IBM.

**Diversity of use**

The solution offers a variety of use. The petroleum industry has vast quantities of rented equipment and material which needs to be kept track of. Rental equipment is extremely costly, and it is important to keep track of its location at all times, and quickly return it after use. The logistics of all material can be dealt with using RFID and wireless units – it can be tracked from the supplier, via the warehouse to the container being placed on the deck of the cargo or supply ship, until the cargo is received offshore.

Petroleum and chemicals suppliers also need to label chemical tanks. For instance at the large chemicals facility at Mongstad there is a great need to keep close track of all chemicals at all times. Asset tracking can help them not only with the logistics for chemical tanks, but also with the quantity of chemicals, when to order and how much.

Chemical plants like Mongstad, with its enormous parts, needs to be operated efficiently and securely, and can save large amounts by using this kind of wireless solutions and handheld units. The operators do not have to run back and forth with documents, but can instead read containers, equipment, tanks, volume or quantity, and update SAP automatically using a wireless solution.

**Tracking of personnel**

Another area of use for the Asset Tracking solution that is being developed for cargo and container tracking, can also be used for tracking of personnel. This will facilitate a higher level of safety for personnel working offshore, and contribute to the HSE asset requirement set for all offshore and onshore installations.

**Smooth Logistics**

With wireless RFID and SAP, proper logistics are secured by the data on the labelled material or equipment being checked against the company’s SAP system. The ID on the wireless RFID chip, attached to the container, is read and its location is being monitored in real-time. The coordinates will be updated in SAP to ensure the correct cargo is being loaded into the correct container. This will further prevent losses and reduce manual errors.

When large quantities of equipment are to be dispatched, it is possible to print pick lists in SAP. All of the equipment can be labeled with an RFID chip that can be attached to any kind of surface, including steel. When an order is placed with a supplier, and the order is dispatched, a pallet can be run through an RFID portal or read by a handheld RFID reader that records the content.

When the dispatch is received offshore, the ID on the wireless RFID chip is read using a handheld RFID reader, and the requisition and work order for the equipment can be updated in SAP.

The solution is based on IBM Middleware, which provides the key glue to the logistics process.

**Voting**

Votes of the Asset Tracking solution for offshore logistics will initially be tested at Egåtorne, where hundreds of containers are loaded and shipped daily, and later implemented on many onshore plants.

Wireless Asset Tracking solves Offshore Logistics

Robotlab Open for Business

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Figure 1: The robot and gantry system

Robotics has for at least three decades been a key technology in many industries for increasing efficiency and productivity. But recently, new computer technologies have made it easier to design robots that can be used in places where people do not need to be present.

The most famous example of this is the robotic arm that is used in the automotive industry. These robots are used to assemble cars on the assembly line, and they can do this much faster and more accurately than people could. They are also much more reliable, as they do not get tired or sick.

However, many industries have not yet been able to take advantage of this technology. For example, many chemical plants still rely on manual labor to move materials around the facility, which can be dangerous and costly. But with the help of robots, these plants can now be automated, making them safer and more efficient.

The purpose of the test rig is to demonstrate the technologies for designing the platforms of the future, which are based on modular process modules, almost like Lego.
TAIL INTEGRATED OPERATIONS

Condition and Performance Monitoring
Turnarounds and Shutdowns
Wireless Communication
Collaborative Visualization
Common Integration Architecture
Robotics Technology
Mobile ICT Infrastructure

Concept for safe and cost-effective operation of facilities