Operational Integrity Management at Statoil

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Overview
Many industrial organizations face pressure to increase workplace and process safety, improve asset performance, and gain visibility into operational risks before incidents occur. Asset-intensive industries continue to suffer from unplanned downtime, failure to meet planned production rates, and too many safety and environmental incidents. Until they can manage and mitigate operational risks proactively, companies will continue to struggle to improve profitability due to continuing production interruptions, lost productivity, collateral brand damage, and loss of shareholder value.

For corporate officers, catastrophic events can now have life-altering consequences. COOs, accountable for operations, must sign documents that confirm compliance across all facilities. This drives them to seek multiple, effective risk-reduction strategies. At the same time, business leaders face unpredictable economic conditions, increasing competition, higher operational costs, supply chain concerns, and an aging asset infrastructure and workforce. These trends challenge COOs and safety officers to make their plants safer and more reliable by increasing visibility into and control over assets, processes, and people. The ultimate goal is to achieve safe, secure, and well-controlled operations to increase operational continuity and profitability.
Statoil’s Journey from Norwegian Offshore Company to Global Energy Player

While Statoil's origins approximately 40 years ago were as an upstream exploration and production company focused on the Norwegian Continental Shelf (NCS), it has expanded its operations over the years to become an integrated international energy company with operations in 35 countries. These include more than 40 production assets plus refineries, terminals, and gas processing plants. Statoil is the third largest crude oil seller and the second largest gas exporter to Europe. Headquartered in Norway with approximately 21,000 employees worldwide, Statoil is listed on both the New York and Oslo stock exchanges.

Recognizing the link between the combustion of fossil fuels and human-induced climate change, Statoil has diversified its energy-producing assets to include both wind and geothermal production assets. The company believes this enhances its business opportunities and supports its objective to use technology and innovative business solutions to meet the world's energy needs in a responsible manner.

Statoil’s stated goal is to be the industry leader in health, safety, and environment (HSE) and seeks to achieve improvements in this area. According to President and CEO, Helge Lund, “HSE must be the first priority in everything we do. Should a conflict arise, safety must always take precedence over production.” To this end, Statoil has worked to further improve its safety culture and better understand and manage risks through various campaigns and training efforts. The company has also developed management systems at all levels to be able to effectively identify, evaluate, manage, and mitigate many business risks. These efforts have yielded significant results and the company continues to make progress managing process safety and risk at the operational asset level.

Operational Challenges and Risk Management

Statoil operates in various challenging environments with different regulatory regimes and operating conditions. Exposure to harsh weather conditions, shipping and logistical challenges, the need to ensure safe exe-
The company has developed its own Work Permit and Safe Job Analysis systems built on SAP technology to provide a standard way to help ensure that the risk-mitigating measures are implemented effectively and communicated to all involved workers.

Statoil has run several programs to help ensure compliance with its management system, improve risk management, simplify and harmonize business processes, govern documentation, and increase focus on technical integrity and its barriers.

How Statoil Analyzes Operational Risks

Statoil personnel regularly plan and prepare activities to be able to identify operational risks at the lowest level. They use various methodologies including HAZOP/HAZID-based quantitative measures supported by Excel spread-sheets or other simple solutions. The company has also developed its own Work Permit and Safe Job Analysis systems built on SAP technology to provide a standard way to help ensure that the risk-mitigating measures are implemented effectively and communicated to all involved workers. The Work Permit system also helps coordinate simultaneous activities, partly through visualization of physical assets in a 3D model of the plant.

Risk analysis for assets largely focuses on process safety to avoid major accidents. On the asset level, the risk management efforts center around three main elements:

- Identifying technical, organizational, and operational (human) barriers to process safety
- Tracking activities executed on the asset, including high-risk activities (hot work, well interventions, etc.), activity conflicts, and total activity level
- Managing external impacts (weather, ship traffic, infrastructure dependencies, etc.)

To be able to establish an accurate risk picture at the asset level, the company believes it’s important to evaluate the barrier integrity against planned
activities and potential external impacts (like traffic, weather and infrastructure dependencies).

**Operational Integrity Enabled by Technology**

Statoil utilized SAP technology within several areas to both improve safety and increase operations efficiency and performance. Most of the company’s operations involve large production assets in remote locations that are often exposed to rough weather conditions and have limited bed and storage capacities. This challenges both safety and performance and requires precision and risk awareness when planning and executing activities. Several initiatives that address these challenges are listed below.

**Technical Integrity Management Program**

Statoil defines technical integrity as “a system’s or equipment’s ability to ensure functionality and containment when and as required in accordance with design specifications, regulations and internal requirements. The company believes that systematic follow-up of the technical integrity is a key element to ensure predictable and safe operations. With oil and gas production assets in various countries like Algeria, Brazil, Canada, the US and the NCS, Statoil previously lacked a uniform approach to technical integrity management and experienced difficulties sharing information across disparate solutions.

The Technical Integrity Management Program (TIMP) developed a common work process and the Technical Integrity Management Portal to help assess, follow-up upon, and report the technical condition of barriers, systems, and equipment on the company’s production assets. The solution, based on SAP Business Warehouse (BW) and SAP Business Objects (BO), consolidates information from a variety of different source systems.

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<th>Information Sources for Technical Integrity Management Program</th>
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The portal helps users visualize the status of technical barriers and assess and document the overall technical integrity of the plant. Technical condition is assessed on the equipment, system, and barrier levels. Information is then presented through indicators that form the basis for technical assessment.

After training more than 1,600 key personnel to use this portal, the company is now in a far better position to identify risks and barriers. This standardized approach creates value by clarifying roles and responsibilities, automating data collection, and enabling continuous overview of technical integrity for each plant.

**Work Permit Management System**

Statoil developed its Work Permit Management System, which incorporates Safe Job Analysis (SJA), on top of SAP R/3 based on specifications from a joint NCS effort. In addition to using the solution internally, Statoil has licensed it to several other energy companies. The Work Permit Management Systems is now a standard, SAP-certified oil & gas solution.

Statoil developed a simple visualization solution using Microsoft .NET technology. This displays the appropriate location of all planned and active work permits in a simple 3D model of the plant. The company plans to further develop this capability.
In 1996, Statoil made the strategic decision to implement one SAP R/3 instance across the enterprise as a core integrated solution for a variety of functional areas such as maintenance, procurement, finance, and projects.

Operational Performance Dashboard (OPD)
Statoil used SAP BW/BO to develop its Operational Performance Dashboard portal solution. Using KPIs and proactive process indicators, OPD measures operational performance on the company’s production assets on a daily basis. It provides drill down options to BW and other SAP-derived data.

Mobile Asset Management
The company has initiated a successful pilot project for its Mobile Asset Management solution, based on the SAP Mobile Asset Management (MAM) platform, at one of its refineries to support operator rounds, data logging, and notifications. It is now running a project to establish mobile solutions for all production assets, with the first priority to support its US onshore operations.

Enterprise Resource Management (ERP)
For ERP applications, Statoil uses SAP to procure materials and services through a vendor portal. It also uses the SAP Warehouse Management System to manage its spare part inventories. However, the company developed its own Remote Logistics Management (RLM) application to support its offshore operations. Based on feedback from the SAP Global Industry Advisory Council (GIAC), SAP now supports RLM. RLM supports a variety of logistics scenarios depending on whether spare parts are stocked onsite site, at a company’s central supply base, or supplied from vendor stock.

Application of SAP Technology in Statoil Work Processes
In 1996, Statoil made the strategic decision to implement one SAP R/3 instance across the enterprise as a core integrated solution for a variety of functional areas such as maintenance, procurement, finance, and projects. The exception to this was a separate instance for Human Resources and Treasury. Standardizing the SAP instance provided an opportunity to improve business performance and establish standard work processes; each with dedicated process owners within the various functional areas (operations & maintenance, supply chain management, etc.). According to Lars Egil Obrestad, Risk Advisor to Operations & Maintenance with Statoil,
having a common corporate solution is nearly a prerequisite for standardizing work practices across the company.

An integrated solution offers additional benefits. These include the ability to measure and benchmark performance across business units and production assets. Statoil analyzes benchmarks using its Operational Performance Dashboard, also based on SAP BW/BO. Proactive indicators measure quality and precision in executing processes on a daily basis. These provide process owners with important feedback and information on best performers from which they can capture best practices. This represents essential input for the overall process improvement work.

Worker competence and behavior are identified as operational barriers, and included in SJA checklists. The company plans to work to extend this to risk analysis on the asset level. Increasingly, the company is focusing on those work processes that represent organizational barriers. It uses a risk-based approach in which process risks are analyzed and requirements evaluated with regard to risk mitigation. The company will continue to improve its methodology, extending it to analyze organizational barriers on an asset level.

Each asset has a total risk analysis (TRA) that describes risk aspects related to major accidents and the effect of safety barriers. The TRA supports risk evaluations and describes areas and activities with high-risk exposure.

**Improvements Realized**

Statoil’s Operator Performance Dashboard (OPD), in conjunction with the on-going change process related to this solution, have enabled the company to shift from a reactive mindset, focusing on coordination and control, to a more proactive approach that focuses on quality and precision when planning and executing activities. Constant benchmarking across production assets includes a daily overview of the ten best performers. By making the underlying results easily available through drill-down, the company has generated a spirit of competitiveness, resulting in significant improvements on many assets.
According to Statoil this improved quality and precision in planning provides:

- Prioritization of the most important maintenance activities
- Minimal re-planning
- Improved quality of requisitions
- Increased wrench time
- Improved cost efficiency
- Reduced downtime
- Improved learning from incidents (especially with focus on human and organizational factors)

The systematic review and follow-up of technical integrity by TIMP improves asset integrity and process safety, reducing the risks for major accidents or unplanned production downtime.

According to Statoil, the Work Permit and Safe Job Analysis solutions also reduced risk and helped ensure safe work execution, improved visibility for better identification of risks related to conflicting activities (i.e., hot work and work on hydrocarbon systems), and improved overview of ongoing activities.

**Statoil’s Ongoing Integrity Management Journey**

In the future, Statoil will continue to focus on improvements within process safety and asset risk management by systematic and proactive follow-up of barriers. The goal is to optimize its portfolio of activities within an acceptable risk level. SAP solutions are an integral part of this. While it has experienced considerable success developing its own solutions based on SAP and other technologies, for new and improved solutions Statoil will decide on a case-by-case basis whether to purchase these outright, develop the solutions in-house, or collaborate with a vendor.

Engineering and other support organizations require additional knowledge and awareness about risks when executing concurrent activities. This applies to both external contractors and the company’s own organization, While the company has recently addressed the need for improvements in this area and initiated training efforts (such as in the in the
drilling and well area), Statoil realizes it still has a way to go to standardize risk analysis methods and tools across process areas like operations and maintenance, drilling, and the well area.

The company manages change using various procedures and solutions. In operations, different work order types are used to manage asset modification activities and update documentation. In the future, the company plans to establish a corporate management of change (MOC) framework.

At the moment, there is not a single Statoil Risk Management Program, but several initiatives focusing on different aspects of risk management. Within operations, the company is working to align focus and priorities across process areas around operational risk management and process safety on the asset level. This includes areas like barrier management, planning, and activity management.

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