

Bygnes pipeline control center well on its way to Y2K compliance

Eleven percent of all natural gas deliveries for Europe are handled by the Statoil Transport Control Center at Bygnes in Norway. Due to the importance of this hub, a very high priority has been given to ensuring that it is Year 2000 compliant. ABB, as the supplier of the system supervising the pipeline operations, has been heavily involved in the Y2K efforts. Statoil and ABB jointly developed a Y2K compliance programme that covered upgrading and testing of the Bygnes facility as well as its many peripheral systems.

The Statoil Transport Control Center (TCC) at Bygnes, Norway, is a major hub for natural gas deliveries in Europe. 90 % of all the natural gas coming from the Norwegian North Sea sector is handled by the center. A vast network of pipelines, controlled from Bygnes, delivers some 11 % of all the natural gas used on the European continent. Among the pipeline owners connected to the network are Phillips Petroleum, Total, Elf, Statoil and Norsk Hydro **1**. Keeping track of the pipeline operations, including the logging and billing of consignments to and from the operators and their clients, is a highly complex task. ABB supplied the system that oversees these operations and monitors the functionality of the pipelines.

A market-oriented company such as Statoil relies on gas deliveries to consumers in Europe being made at the right time and on quality being maintained at a constantly high level. To monitor the huge volumes of gas passing

through Bygnes every day on their way to European buyers, the facility has a so-called transport control system (TCS). Its functionality is ensured by an integrated SCADA system, supported by an Automatic Message Handling System (AMHS) and a Pipeline Monitoring System (PMS) **2** (see box).

Y2K commitment at ABB

As part of the Y2K efforts being made across the oil and gas industry, Statoil has been running extensive tests at the Bygnes TCC to ensure that it will function properly after the turn of the millennium. ABB has been working closely with Statoil and other customers in the industry for some time to ensure that

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Systems installed in the Statoil Transport Control Center (TCC)

SCADA

A SCADA (Supervisory Control and Data Acquisition) system monitors the gas transported by the gas pipelines in real time. It does this by collecting process and metering data from the terminal units on the North Sea platforms and at the various on-shore terminals within the network.

The central SCADA computers are located at Bygnes, while the RTUs (of which there are many) can be up to a thousand miles away.

The SCADA system in the Transport Control Center was upgraded in 1998. This upgrade included some new hardware, more capacity in the form of extra connections to new offshore installations, plus assured Y2K-compliance for the overall system.

PMS

The Pipeline Modelling System (PMS) simulates pipeline conditions in real time on the basis of data transferred from the SCADA system. It uses so-called 'look-ahead' and predictive models to determine future problems and simulate scenarios before their implementation. The purpose of the PMS, which is based on the standard Pipeline Modelling System configuration for batch tracking and leak detection, is to ensure high quality for the distribution system.

AMHS

Constructed in an Oracle environment, the Automatic Message Handling System (AMHS) sends and receives messages to and from the various supply companies and their customers in continental Europe. Via telex, telefax and X.400, the system checks, processes and generates messages relevant to the orders, and consequently plans the delivery, logging and billing of all gas deliveries in the Statoil TCC network. The information is used to plan pipeline activity and gas deliveries on a daily basis.



Statoil's Transport Control Center at Bygnes handles 90% of all natural gas from the Norwegian continental shelf and 11% of all natural gas deliveries for Europe. The total length of the Norwegian gas network is 6,500 km. Gas exports are estimated to grow to 65 billion cubic meters in 2000.

— Gas pipelines

there is only a minimal risk of their systems being disrupted by the Y2K problem. All current ABB products are being tested and certified well before the critical dates [1-3]. However, the Y2K com-

pliance of older systems, which have been delivered to every corner of the world, is equally important and is central to ABB business policy. While it is generally unnecessary to upgrade ABB sys-

tems, possible exceptions could be some of the operator stations or information management stations.

As part of its commitment to helping customers deal with the Y2K issue, ABB has formulated a 'four pillar strategy' which addresses the problem as a whole. The four pillars are:

ABB product investigation and classification

All ABB products are investigated for the purpose of evaluating their compliance status. This information is made available both externally and internally.

Inventory of all plants

Working together with the customer, lists are made of all the installed equipment, whether from ABB or third parties.

Pilot projects for development of a methodology

In liaison with pilot customers, ABB investigates 'typical' plants in order to identify typical problems and thereby generate repetitive effects.

Training

Customers' personnel (first priority) and ABB service staff (second priority) are trained in the specific skills and knowledge needed to tackle the Y2K problem [4].

Y2K testing in the Norwegian offshore sector

Working closely with the large operators in the Norwegian offshore sector, ABB has launched extensive Y2K programmes which, besides carrying out tests, also looks at the possibility of

upgrades. As an example, the 120 or so computers on Statoil's Sleipner platform were tested during a maintenance shutdown. Equipment on the Gullfaks A, B and C platforms, which are also owned by Statoil, were tested while in full operation. The Amoco-operated platforms Valhall and Hod were tested and certified during scheduled maintenance shutdowns. Installations on Gyda and Ula, two platforms operated by British Petroleum, were also tested, as were the installations on Shell's Draugen platform. The FPSO Varg vessel, operated by Saga petroleum and a recent addition to the Norwegian continental shelf, was fully tested before start-up of production. Testing is also under way at the Ekofisk field operated by Phillips Petroleum.

On shore, ferrosilicon smelting plants at Sauda, Bremanger and Bjølvefossen were tested while in full operation. For FPSO Varg, ABB was contracted to perform Y2K testing of other subcontractors' equipment as well as its own installations. No problems warranting any further action were found during any of the tests carried out on the ABB equipment.

Statoil Y2K programme

Statoil of Norway has given a high priority to the Y2K issue and is investing considerable effort in finding solutions that will make sure its operations are not disrupted by the Y2K bug. These efforts included the evaluation and, in some cases, upgrading of the Bygnes TCC. The cooperation between ABB and Statoil during testing of the TCC was an essential factor in the success of the project. Besides testing and upgrading, Statoil has considered building a model of the ABB SCADA system for use in current as well as future testing and simula-

tions. As a closed system, the SCADA installation at Bygnes is Y2K-compliant, but because of all its interfaces to other systems, both onshore and offshore, its functionality within the Bygnes TCC had to be tested more extensively.

System upgrades

During the past two years, the installations at Bygnes have been upgraded significantly as part of a general upgrade programme. An added bonus of this was that the specifications for the new equipment included Y2K compliance. In addition, a Y2K test routine was performed on both new and older equipment, being extended to equipment throughout the gas transport network. As a result of the upgrade, the network at Bygnes has been divided into an office network and a production network, with a router installed to separate them.

Statoil decided to migrate its systems to Digital Unix 4.0, running on Alpha-

server 1000. The production network now has two AMHS stations, with a RAID system for storage. The Pipeline Modelling System has also migrated to Digital Unix.

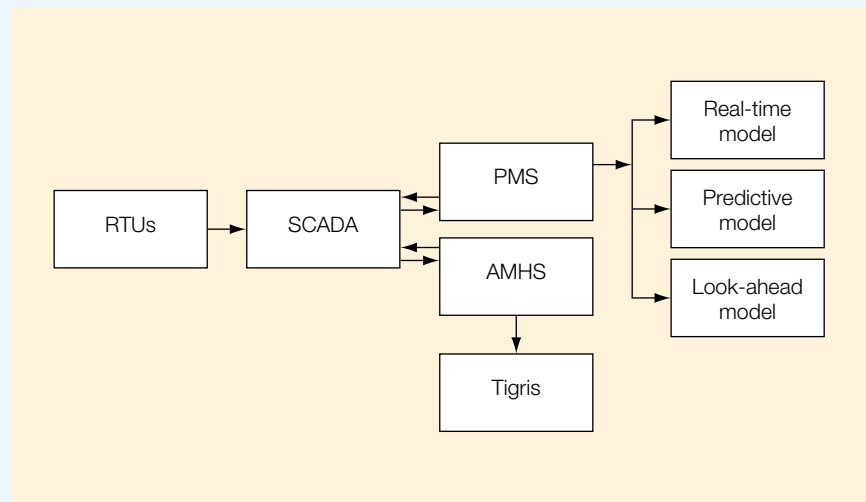
ABB previously helped to upgrade the SCADA system to Digital Unix 3.2G, which also runs on Alpha-server 1000. All three operator workplaces in the control room have been replaced **3**, while the large mimic display has been replaced by an X-wall display. The SCADA system now receives data from a third-party front-end system, and is also configured to receive data from an ABB front-end system.

The office network features 1 SCADA station, 1 PMS station and 1 AMHS station, configured to replicate all data on the stations in the production network. Operators at the workstations in the office network are also able to view the data.

Computer system installed at the Bygnes Transport Control Center



- AMHS *Automatic message handling system*
- PMS *Pipeline modelling system*
- RTU *Remote terminal unit*
- SCADA *Supervisory control and data acquisition (master system)*
- Tigris *Non-ABB computer system used to keep track of where gas deliveries come from and who owns them*





The operator workstations in the control room at Bygnes TCC were replaced recently as part of a general upgrade programme. The specifications for the new equipment included Y2K compliance.

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Summary

Cooperation between ABB and Statoil was essential to successful upgrading and testing of the Bygnes facility and its vast network of pipelines and peripheral systems. When testing for problems relating to the changeover to the new millennium, systems with many connected subsystems from different suppliers are perhaps the most complicated ones to manage. The extensive Y2K programme introduced by Statoil will ensure that the Bygnes facility is properly prepared to deal with whatever might come at midnight, December 31, 1999.

References

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