Borregaard’s Automation Migration: Strategic Tool for Business Improvement

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Introduction

In 2001 Borregaard started on the route to gather operations from all its different process units into one centralized control room with a common Human-Machine Interface (HMI) for all operators. At that time, the company purchased its first Honeywell PlantScape system to operate a new recovery boiler. The plan was to operate this boiler, together with oil/electrical boilers, an SO₂ boiler, and water/wastewater treatment systems, from a common control room and operator interface. Experience gathered from this pilot project, together with the challenge of reducing operational costs, caused Borregaard to undertake a reorganization of all its operations. Based on pre-studies during 2007 and 2008, a formal decision was made in November 2008 to proceed with the project.

The following white paper describes the process of moving from a decentralized, multiple operations organization to one common, centralized operation running from a single control center. This included upgrading legacy Honeywell automation systems to the latest Experion Process Knowledge System (PKS) technology, as well as migrating outdated, third-party Distributed Control System (DCS) and Programmable Logic Control (PLC)-based systems to a common automation platform.

Background

Borregaard operates the world’s most advanced biorefinery, and is an international company with strong global presence in wood-based chemicals and other selected niches of organic chemicals. It develops and supplies specialty cellulose, lignin products, vanillin and bioethanol for a wide range of applications. Borregaard has production plants and sales offices in 20 countries.

Borregaard’s pulp & paper operation in Sarpsborg, Norway, was originally established in 1889. Over the years, significant investments have been made in the facility, including a new pulp-drying machine; new cutting, baling and, reeling equipment; and conversion of the bleaching plant to sulphite pulp. The original digester house, built in the early 1950s, was completely modernized with new stainless steel digesters and a new chemiwasher. As a result of this, the entire pulp line has been either rebuilt or refurbished, which makes the Sarpsborg site the most modern sulfite plant in the world (See Fig. 1).

Figure 1. Borregaard’s pulp & paper operation in Sarpsborg, Norway.
Migration Challenges

In 2002, Borregaard installed two Honeywell PlantScape R400 systems at the Sarpsborg facility in order to standardize control systems for its water treatment plant, boiler house and recovery boiler. This was the beginning of a five-year project focused on centralizing process automation under a single control center, including replacement or interfacing of existing Foxboro IA, Fisher-Rosemont RS3, Emerson DeltaV and PLC-based systems, as well as the older Honeywell TDC 2000/3000 systems. The goal was to reduce complexity and increase productivity throughout the production operation.

Borregaard subsequently had to find the most expeditious way for a continuous upgrade from PlantScape R400 to Experion R210 and then to Experion R300.

Management at the Sarpsborg mill sought a secure, predictable technology migration path for the long haul, combining the existing, disparate systems into one powerful and centralized automation solution, which would enable operators to oversee production processes from a single control platform with a common HMI.

The key project requirements included:

- Ability to standardize on a platform that afforded flexibility and increased reliability and efficiency
- Centralized control room with common operator interface for improved effectiveness and operator confidence
- New, state-of-the-art automation system to reduce the number of required resources and provide more accurate information for faster decision-making
- Enhanced HMI to help operators perform their jobs more efficiently and effectively

Borregaard was faced with minimizing cutover time and reducing risk through stepwise implementation of new control technology, since lost production would translate into lost profits. Most of the system migrations had to be completed during very short shutdown periods, which required reusing existing field termination as much as possible while replacing all controllers and I/O boards to gain the advantages provided by modern control technology.

New Technology

With a long-standing partnership already in place, Borregaard turned to Honeywell for help with its control system upgrade. Honeywell was chosen based on its competitive pricing, proven technology, onsite support, and turnkey solutions for technology migration. With a five-year timeline in mind, Borregaard looked to replace its outdated PLC and DCS infrastructure with Experion PKS.

The upgrade from legacy automation technology was completed with the help of Honeywell’s services team and local support personnel. Borregaard was able to modernize its DCS platform to meet its process control needs. This not only included all the upgrades and patches required throughout the years, but also a three-year services contract to help support the overall migration project.

From 2001 to 2005 (and to the present day), Borregaard implemented five different versions of Honeywell’s advanced control applications from PlantScape R400 to Experion R400—the latest release of the powerful Experion PKS solution. Experion R400’s robust features include integrated safety, peer-control data interface, C300 simulation, Series C digital input-output (I/O) with sequence of events, cyber security, automated “backup and restore” capabilities, and alarm shelving (See Fig. 2).
The mill’s process control network employs a Distributed Server Architecture (DSA) to consolidate operator consoles across their multiple Experion systems. It enables global access to points, alarms, interactive operator control messages, and history data across the different systems, eliminating the need for database duplication and gateways.

Borregaard’s new centralized control center utilizes Honeywell’s HMIWeb technology, which incorporates HTML as the native display format to provide access to process graphic displays from the Experion Station environment. The use of an open, industry standard file format reduces engineering time while allowing displays to be reused between systems.

As part of the enhanced HMI design based Abnormal Situation Management (ASM®) Consortium guidelines, level one overview displays provide operators and operations management with a view of abnormal operating conditions (often as large screen displays). Level two overview displays contain the positions control room personnel frequently use in specific operating situations (e.g., startup/shut down or normal stable production). Level three displays include traditional PI&D graphics showing every detail of the process and related instrumentation. Level four detail displays, faceplates and pop-ups provide the details of devices, group starts, etc. (See Fig. 3).

Figure 2. Borregaard implemented Experion R400—the latest release of the Experion PKS solution.

Figure 3. New level 2 HMI display based on ASM guidelines.
Borregaard’s Digital Video Manager (DVM) installation includes 100 analog cameras connected to 14 different matrixes. Camera signals are converted to digital streams, which are then distributed through the Local Area Network (LAN). The Experion Stations not only show live video from locations throughout the mill, but also provide the ability to switch cameras, and pan, tilt or zoom the camera to focus in on a particular area. This allows the mill to extend its remote monitoring capabilities and integrate video stream and analytics with process control applications. Additionally, it enables operators to observe hazardous or inaccessible areas from a distance and detect events beyond traditional sensor capabilities. They can even monitor workers and validate potential environmental and safety incidents (See Fig. 4).

![Digital Video Manager (DVM) rack.](image)

Borregaard also implemented FOUNDATION™ fieldbus, which when integrated with Experion, helped them decrease commissioning time. FOUNDATION fieldbus was chosen because it is a proven technology that provides an open communications protocol for control and instrumentation.

**Project Results**

Since 2001, Borregaard has gone through various installation phases of its automation system upgrade. It now has eight Honeywell Experion PKS systems running on three different releases at its Sarpsborg facility. Utilizing the latest digital bus solutions integrated with Experion, the company established a mill-wide standard that handled continuous upgrades and defined a vertical migration strategy enabling it to implement new technology without any production loss.

More than 20,000 control loops are currently managed from the mill’s centralized control center, while the number of console operators has been reduced from 12 to 6 per shift—with the potential for further reductions. A stepwise transfer of operators into the new control room proved to be effective. Operators with pilot training quickly became accustomed to the new surroundings and adapted to the updated control system. There is increased interaction between personnel who have a better process understanding of the entire plant, and managers now have quick access to mill operation status.

Going forward, Borregaard plans to consolidate its Experion installations by updating all the systems to R400 and reducing the number of servers. All servers will be moved to a new server room, with implementation of a remote backup location, patch management and remote support. In addition, the next generation of level one display development will be focused on reducing the number of parameters and Key Performance Indicators (KPIs), and on improving shapes. This will be accompanied by additional training for operators on level one and level two displays, as well as further education of personnel in utilizing Experion Station functionality such as trends, alarms, event logs, detail displays, and control module and Sequential...
Control Module (SCM) charts. New advanced alarm management and advanced control applications are also on the horizon (See Fig. 5).

![Automation Migration Control Center](image)

**Figure 5. More than 20,000 control loops are currently managed from the mill’s centralized control center.**

**Conclusion**

Borregaard has been able to solve its technical problems and meet its continuous need for the most updated process control technology without compromising initial investments. At the same time, network redesign and the adoption of best practices have improved system performance and stability. All of the automation upgrades have been completed, and the company has a solution primed for the future. This includes a centralized control center that is more automated and, as a result, more efficient and informative to help operators make better decisions affecting operational performance. Best of all, management now regards automation as a strategic tool for future business improvements.

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**More Information**

For more information on Honeywell Control Systems, visit our website at [www.honeywellprocess.com](http://www.honeywellprocess.com) or contact your Honeywell account manager.

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