● UPM: Renewables boiler for self sufficiency
● ABB: Better ways to maintain automation systems
● Honeywell: Controlling energy costs on tissue lines
● Heimbach: Cost savings from press felt optimization
New technology is fast finding its way into modern paper mills and the process controls of manufacturing lines, something that we welcome with open arms as these technologies help us to better visualize and control the paper-making process.

For successful lifecycle support it is important to realize that this new technology comes with new challenges for maintenance of these systems throughout their lifecycle. A modern automation system is an evolving structure that has a continuous life cycle, and with correct maintenance can provide its users with the highest-possible benefit at the lowest risk.

Along with ensuring high reliability, keeping an industrial automation system up to date will allow the user to easily take advantage of new and advanced technologies, without having to exchange the complete system.

History of the industrial automation system

Around 50 years ago the first attempts were made to introduce microelectronics into automation technology, starting the era of modern solid-state controls in industrial automation.

For the first 25 years the market was determined by the supplier’s standards. The established suppliers developed their systems from scratch, each supplier applying their own system philosophy and system architecture.

The second 25 years shows a clear change to a more open architecture. With the increased need to understand the production processes better, the data available in the systems had to become more accessible. Data exchange between systems horizontally (between multiple control systems) and vertically (between control systems and mill management systems) became a necessity.

At the same time as the industry increased the need for process data, the available technology changed and with that, the general philosophy of the industrial automation system. The personal computer (PC) started to dominate the scene and opened the world of computers to the general public. Bill Gates and Paul Allen successfully developed and marketed user-friendly programs that ran on Ed Roberts’ computer assembly kit, the Altair, and with that the era of Windows was born.

In the late 1990s the focus of the industry for industrial automation was towards these PCs and the Windows operating system. The visionaries promoted a common network backbone allowing all systems, independent of supplier, to interface seamlessly. This common system architecture was derived from the
office automation, where such architecture was, and still is, common practice. Although there are slight deviations from this early vision, the main idea was in place. Intersystem communications have been standardized on fieldbus and networking technology. Data storage, handling and visualization have been standardized on PC and server technology.

The industrial automation system of this day and age consists of three main product layers:

- Layer 1, I/O and field device layer
- Layer 2, control layer
- Layer 3, operator interface and data management layer

Each layer has its own characteristics. The interface to the process, the field layer, is based on hardware and communication compliant with fieldbus standards. The trend is that this hardware is becoming increasingly interchangeable among the various platforms.

The control layer is the foundation of automation, based on purpose-built hardware, control and engineering software. In general this layer is driven by the control application, resulting in the software not to be portable among the different platforms.

The third and most standardised layer is the operations and data management layer. It’s this layer that brings ‘IT’ into industrial automation and in most cases is based on the Microsoft platform, common with business systems, and custom off-the-shelf (COTS) client, server and network hardware.

Especially in this third layer, the use of COTS technology has had a major impact on system capability and functionality but also brings new challenges to the way we maintain a modern industrial automation system.

The challenges of maintaining a modern Industrial Automation System

If we take a closer look at the three levels described it can be concluded that each has its own characteristics and with that how we manage the maintenance of each of these;

- Layer 1, I/O and the field device layer is based on hardware and communications that in most cases apply established (fieldbus) standards, thus enabling easy interchange among the different platforms. Configuration changes at this level are accompanied with a medium risk. The typical lifespan of the system components is 10-15 years.
- Layer 2, the control layer, consists of purpose-built hardware and software, in most cases based on commercially-available central processing units (CPU) and operating systems (OS), in some cases embedded. It is in the control layer the custom built application software is housed. Changes at this layer are therefore of higher risk. The lifespan at this layer is in general from 15 to 20 years.
- Layer 3, operations and information management level, is the most standardised throughout the industry from a hardware and software viewpoint. The use of COTS hard and software at this layer allows for easy expansion of functionality but also has the shortest life-span, typically from four to six years.

It is this last layer that brings the most challenges to the maintenance and service of a modern industrial automation system. To ensure a long-term reliable platform, several aspects have to be addressed:

- Increased complexity of the systems has lead to a change in the level of interaction. Where in the past the maintenance engineer could repair system parts at component level, increased complexity, reduced size and applied techniques, such as surface mounted devices (SMD), in many cases only allow exchange of parts at printed circuit board (PCB) or even exchange at unit level.
- With more and more COTS products being applied, industrial automation suppliers and users are confronted with new releases, which can cause compatibility issues.
- Technology is evolving increasingly quickly with new functionality coming on-line in an increased pace, to be able to benefit from these it is essential that the systems should be easily upgradeable.

From the above we can conclude that maintaining a modern automation system is vastly different than in the past, when the focus was mainly on two areas; namely modification and expansion of the application software and repair of system components.

Maintaining the application is still a main focus area of a modern system; the repair of system components however is being replaced with exchanging at unit level and the need to keep systems up to date. Maintaining and managing the system lifecycle is becoming an important focus area for the mill maintenance department. This was recognized early by ABB which has positioned itself as the industry leader in life cycle management and can assist its customers to manage their systems and predict the future costs.
The four steps to successful life cycle management

A modern automation system is an evolving structure with a continuous life cycle that requires the correct maintenance to provide its users with the highest possible benefit at the lowest risk and costs.

Four Ss (steps) can be defined to assure successful life-cycle management:

- Set-up
- System Integration
- Software management (Sentinel)
- Support (remote)

A good life-cycle management programme starts when the system is set-up: the system has to provide the paper mill with the right functionality without compromising the upgradeability of the system. ABB’s long term experience helps customers implement the system into the process with the required functionality but also maintaining the ability to upgrade and enhance the system. This is enabled by the unmatched functionality provided by the ABB IndustrialIT technology.

In a modern paper mill different systems are required to communicate (horizontal integration) as well as provide communication to the mill’s business systems (vertical integration). In many traditional mills the required functionality is covered by a number of (stand-alone) systems, and upgrading one system can impact the overall picture with unwanted side effects. ABB Pulp & Paper provides unmatched system integration. Solutions for Quality Control, Distributed Control, Paper machine Drives, Web Inspection and Collaborate Production Management are all based on ABB IndustrialIT. This integrated solution can be seen as one system, providing a clear and predictable upgrade path with minimal impact on communication links.

An important aspect of assuring system reliability is timely upgrades of the various system layers, especially Layer 3, the operations and data management level, which requires increased attention, the COTS hardware and software used at this layer typically has a life span of from four to six years. Managing the impact on production and minimising the costs of these upgrades is something that maintenance managers are often confronted with. The ABB Sentinel software management programme allows the customers to easily evolve to the latest available software, ensuring up-to-date systems that are current with the latest technology and easily expanded with new enhanced functionality.

The ABB Sentinel programme provides the highest maintenance resolutions guaranteeing the highest level of security and stability. Customers benefit credit for previous software purchases, resulting in lower costs when mapping to the latest system software solutions.

In the case of a system defect the downtime can be reduced by making use of the remote support functionality that all ABB IndustrialIT based systems support. From remote support centers ABB experts can log into the systems to determine the defect and instruct local mill personal as to which parts to exchange, reducing the time that is lost, due to travel in a conventional on-site intervention.

The ABB remote support allows for continuous remote monitoring of the system, so that interventions can be made before failures affect the production process. For customers that provide their own maintenance, ABB’s remote-support provides an on-line maintenance programme that assists users in the performance of optimal and timely preventive maintenance.

ABB Sentinel and remote support is available for new as well as existing users of ABB systems. The programmes will allow ABB customers to protect their existing ABB assets and insure the lowest life cycle costs. This concept is not new to ABB, which as the long-term supplier to the industry has an unmatched experience in this area. Many users have already benefited and there are many examples of how the life cycle of existing systems has been extended together enhancing the functionality.

A reliable, evolving system

With the changing of the industrial automation system architecture it is important to adapt a new way to maintain industrial automation systems. To ensure the highest benefit at the lowest risk, one must manage the system life cycle actively, starting with the initial system setup creating the maximum functionality based on system standards and maximum integration.

A good software management programme supporting cost-effective system upgrades, combined with the advantages of remote support, will ensure a reliable evolving system providing the highest benefit at the lowest risk and costs.

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