The new way to maintain a modern automation system

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New technology is fast finding its way into modern paper mills and the technology that controls the paper processes, something that we welcome with open arms as these technologies help us to visualise and control the papermaking process better. For successful lifecycle support it is important to realise that this new technology comes together 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. 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 and manufactured their systems from scratch, each supplier applying their own system philosophy and system architecture.

The second 25 years showed 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 in horizontal (between multiple controls systems) and vertical (between control systems and mill management systems) direction 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 scenery and opened the world of computers to the general public. Bill Gates and Paul Allen successfully developed and marketed user friendly programs that run on Ed Roberts' computer assembly kit, the Altair, and with that the era of Windows was born.

In the late 90's 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 the 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 is in place. Intersystem communications have been standardised on standardised fieldbus and networking technology. Data storage, handling and visualisation have been standardised 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) and layer 3 (operator interface and data management layer).

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 more and more interchangeable among the different 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 effect on system capability and functionality but also brings new challenges to the way we maintain a modern industrial automation system.

If we take a closer look at the three levels described previously, 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 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 to 15 years.

Layer 2, control layer consists of purpose built hard and software, in most cases based on commercially available Central Processing Units (CPU) and Operating Systems (OS), in some cases embedded. 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 15 to 20 years.
Layer 3, operations and information management level, is the most standardised throughout the industry from a hardware and software objective. The use of COTS hard- and software at this layer allows for easy expansion of functionality but also has the shortest life-span, typically 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 be able to insure 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 (like 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 faster and faster 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 recognised early by ABB and addressed, in time the company has developed itself as the industry leader in Life Cycle Management and can assist its customers to manage their systems and predict the future life cycle costs.

**Successful Life Cycle Management**

A modern automation system is an evolving structure that has 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 steps can be defined to assure successful life cycle management: Set-up, System Integration, Software Management (sentinel) and Support (remote).

A good life-cycle management program starts when the system is initially set-up; the system has to provide the mill with the correct functionality, without compromising the upgradeability of the system at hand. 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 together...
(horizontal integration) as well as communication to the mills business systems (vertical integration). In many traditional mills the required functionality is covered by a number of (stand-alone) systems, upgrading one system can impact the overall picture, with unwanted side effects. ABB Pulp & Paper offering 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 different system layers, especially layer 3, the operations and data management level, requires increased attention. 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 maintenance program 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. This program provides the highest maintenance resolutions guaranteeing the highest level of security and stability. Customers benefit from credit for previous software purchases, resulting in lower costs when mapping to the latest software solutions.

In the case of a system defect, the system downtime can be reduced by making use of the remote support functionality that all ABB IndustrialIT based systems support. From remote support centers, experts can log into the systems, determine the defect and instruct local mill personnel on 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 prior to failures actually affecting the production process. For customers that provide their own maintenance, this remote support provides on-line maintenance programs, assisting users to perform optimal and timely preventive maintenance.

ABB sentinel and remote support is available for new as well as existing users of ABB systems. The programs will allow customers to protect their existing assets and ensure the lowest life cycle costs. This concept is not new to ABB, as the long term supplier to the industry, it has an unmatched experience in this area. Many users have already benefitted 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 program 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.