exit issues

The new way to maintain a modern automation system

By Paul Goss, ABB

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 visualize and control the papermaking process better.

For successful lifecycle support it is important to realize 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 where made to introduce microelectronics into automation technology, starting the era of modern solid-sate 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 its 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 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 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 is in place. Intersystem communications have been standardized on standardized 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, each with its own characteristics:

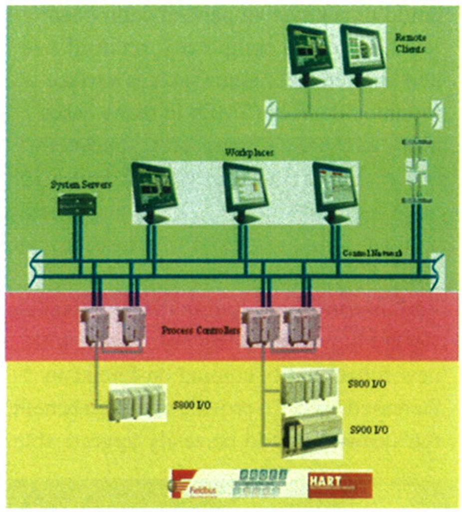
- Layer 1: I/O and field device layer
- Layer 2: Control layer
- Layer 3: Operator interface and data management layer

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 standardized 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 previous it can be concluded that each has its own characteristics and with that how we manage the maintenance of each of these;

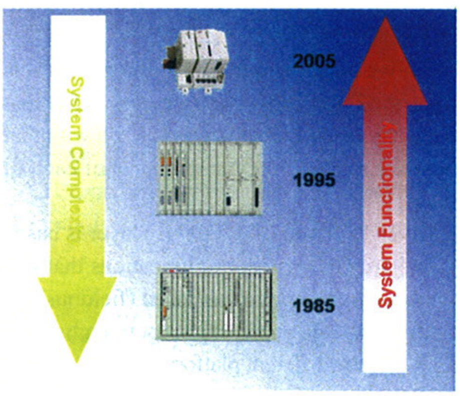
- Layer 1, I/O and field device layer is based on hardware and communications that in most cases apply established (fieldbus) standards, this enabling easy interchange among the different platforms. Configuration changes at this level are accompanied with a medium risk. The typical lifespan of the system components is 10-15 years.
- Layer 2, 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 15-20 years.

- Layer 3, operations and information management level, is the most standardized 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 4-6 years.

It is this last layer that brings the most chllenges to the maintenance and service of a modern industrial automation system. To be able 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 allow exchange of parts only at printed circuit board (PCB) or even 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 ever faster, with new functionality coming on-line at an increased pace. To provide optimum benefit, the systems should be easily upgradeable.



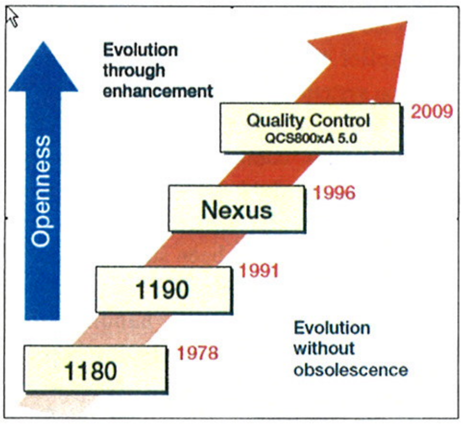
From the above we can conclude that maintaining a modern automation system is vastly different from what it was when the focus was mainly on two areas: namely modification and expansion of the application software; and repair of system components. Maintaining the application is still a main focus area 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.

THE FOUR STEPS

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 **S's** (steps) can be defined to assure successful life cycle management:

- Set-up
- System integration
- Software management (Sentinel)
- 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.

In a modern paper mill different system 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. Integrated solutions such as those provided by ABB 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, the COTS hardware and software used at this layer typically has a life span of 4-6 years. Managing the impact on production and minimizing the costs of these upgrades, is something that maintenance managers are often confronted with. The ABB Sentinel software management program allows the customers to easily evolve to the latest available software, insuring up-to date systems that are current with the latest technology and easily expanded with new enhanced functionality.

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 centres experts can log into the systems determine the defect and instruct local mill personal what parts to exchange, reducing the time that is lost, due to travel in a conventional on-site intervention. The remote support allows for continuous remote monitoring of the system, so that interventions can be made before failures actually affect the production process. For customers that provide their own maintenance, the remote support provides on-line maintenance program assisting users to perform optimal and timely preventive maintenance.

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 insure 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. TW