System 800xA
Solutions Handbook

Power and productivity
for a better world™

ABB

**System 800xA
Extended
Automation**

Introduction

**The power
of integration**

**Operator
effectiveness**

**Automation and
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**Integrated
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System 800xA Extended Automation Introduction

Dear valued existing or potential System 800xA user,

System 800xA is ABB's flagship Collaborative Process Automation System (CPAS) offering for all of the major industrial process manufacturing facilities globally. Since its introduction in 2004, we are fast approaching having an impressive 10,000 installed systems spanning 100 countries. This large and growing installed base of 800xA has helped make ABB the #1 DCS supplier in the world every year for the last decade.

However, although we have a mature, reliable system based on the latest technology and every feature imaginable, nothing stands still. There are always new emerging technologies and trends that we have to leverage and provide to our existing and new customers. That's why we created this 'System 800xA Solutions Handbook'. At first, this was used to help our sales and project engineers 'keep up' with an ever-changing environment. Once released, many of our account managers around the world asked for a customer version, so we're making it available to you as a primer for certain technologies and automation topics, as well as to provide a little information on what 800xA can do for you and your business.

This guide is organized with different tabs starting with what we feel are four game-changing areas that can impact your business. These areas are operator effectiveness, process automation and power integration, enterprise asset management, and integrated safety, which are all related to collaborative process automation. These main topics are followed by other automation system-related topics that seem to come up in all of our customer visits, user groups, and meetings. Each topic begins with a 'primer' containing general information. This section is followed by what ABB can provide as part of a total solution using 800xA. In addition, there are some 'key specifications' that you can use if you are creating a Request For Quotation (RFQ) to ensure that you get the best solution possible for your company.

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Introduction – Continued

I truly hope you find this useful. This is just a start and more entries will be created over time. We will make these available in hard copy and digitally through your ABB business contact. If there are topics you need information on, we urge you to contact your account manager and have them contact me or one of our many System 800xA champions.

Sincerely,
Roy Tanner
System 800xA Product Group Marketing
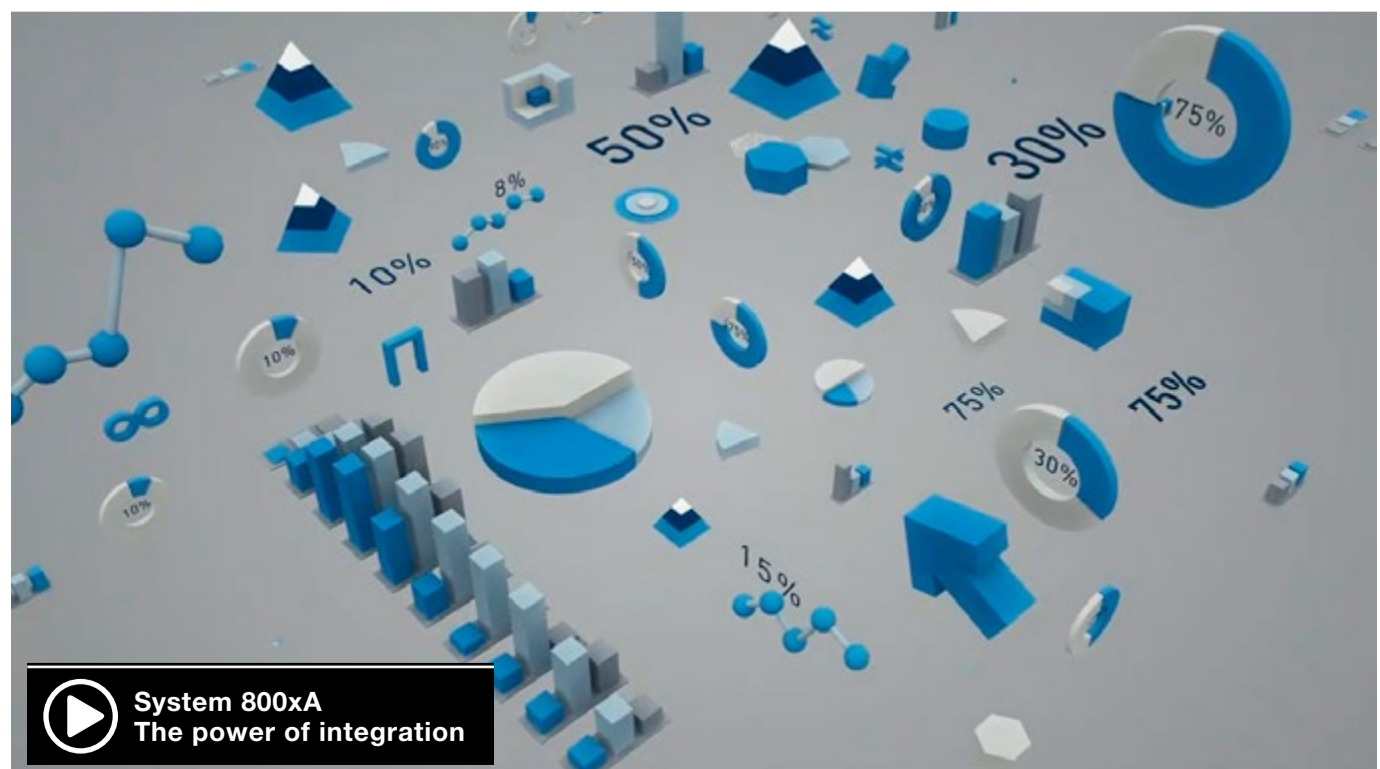
System 800xA Extended Automation
The power of integration

Collaborative process automation

The evolution of the traditional distributed control system (DCS) into today's more capable and all-encompassing process automation architectures has been chronicled by analysts at the ARC Advisory Group as the advent of the collaborative process automation system, or CPAS. In simplest terms, 'collaboration' implies the need for systems to share information in order to perform optimal control actions and for people to make sound business decisions. For this to become reality, a culture change needs to occur, including using an environment that allows field devices, various automation systems, and applications to share information without barriers. CPAS is that environment.

System 800xA – The collaborative process automation system

Collaboration between people and systems is fundamental to increasing engineering efficiency, operator effectiveness, safety and asset utilization. In fact, the 'xA' in System 800xA stands for 'Extended Automation'. System 800xA is the only automation platform that unifies the ability to engineer, commission, and execute automation strategies for process, power management, electrical and safety in the same redundant, reliable system. The extent of integration offered by most automation suppliers extends only as far as a select set of fieldbus technologies and loosely-integrated, bolted-on applications. This means that their solutions will be severely limited in functionality and delivered business value. Users thus need to ask questions, know their goals, and understand what is possible.

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At its core, ABB's System 800xA provides the collaborative environment necessary for the formation and execution of sound business decisions. Based on 'Aspect Object' technology, ABB's integration architecture relates all plant data (the Aspects) to specific plant assets (or Objects). The platform's client-server architecture streamlines controller communications, centralizes configuration and back-up tasks, and provides system-wide management of data for trend, history and audit trail purposes. System 800xA also provides hardware freedom of choice regarding server and workstation computer hardware, even leveraging virtualization technology to streamline and simplify computer systems maintenance.

ABB's System 800xA is an automation platform that includes a full complement of integration capabilities. 800xA has more than a dozen communications protocol Interfaces to our AC 800M controller base, as well as pre-integrated interfaces to multiple automation systems from ABB and other suppliers. And with integration hooks for a range of third-party software applications, System 800xA is ready now – and in the future – for any automation integration challenge.

800xA provides the collaborative environment necessary for the formation and execution of sound business decisions.

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The power of integration – Continued

Promoting collaboration through integrated plant systems and applications

Collaboration between people and systems is a necessity to increase engineering efficiency, asset utilization, energy savings, and improve operations. System 800xA's 'xA' stands for E**x**tended **A**utomation and it was built for collaboration. System 800xA is the only automation platform that has the ability to engineer, commission, control, and operate automation strategies for process, power, electrical and safety in the same, redundant, reliable system. That's the power of integration.

Improving operator effectiveness through integrated information

System 800xA and its use of Aspect Object™ technology provides a unified environment for operations and control that helps our customers increase their operator effectiveness and production performance. It does this by integrating information regardless of its source and then filtering out irrelevant information through features such as personalized workplaces, advanced alarm management, and multi-system integration. In addition, the human factors-aware extended operator workplace console keeps the 'operator in focus' by providing unparalleled operator ergonomics, control room consolidation and a pre-integrated large screen operator view display for plant-wide visualization. That's the power of Integration.

Generating cost-effective solutions through integrated engineering

System 800xA's award-winning Aspect Object™ technology allows you to engineer 'the extended solution'. With System 800xA, you perform the same steps for engineering, but get a lot more for the effort. Using 800xA's integrated engineering, adding a new tag to the system configures it to include extended features in addition to the control strategy, e.g. its operator interface (faceplate, alarm lists, audit trail, trending), short-term and long-term historian configuration, asset optimization and links to business or computer maintenance management systems (CMMS) – and at the same time. That's the power of integration.

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System 800xA Extended Automation
The power of integration – Continued

Achieving seamless control through integrated, unified fieldbus networks

The controller is the heart of the control system and often taken for granted as a commodity. This is not the case with System 800xA. System 800xA's flagship controller, AC 800M, has the ability to integrate various networks, fieldbuses, serial protocols, and I/Os to provide seamless execution of process control strategies as well as safety, electrical, quality control, and power management and substation automation applications. System 800xA offers a full range of fieldbus networks as part of its automation infrastructure. This flexible, unified field network architecture supports improved visibility between usually disparate systems, enhanced device diagnostics as well as control in the field. Significant benefits can be achieved, including process integrity, high availability, and open and scalable information integration across the plant. That's the power of integration.

Providing flexible evolution paths through seamlessly integrated controller platforms

ABB's control systems are designed for continuous evolution. Our goal is to protect our customers' intellectual investment; evolution services are therefore available that provide competence and cost-effective solutions for evolving the installed base of ABB and third-party control systems to System 800xA. Not only do we provide an active path for all hardware and software, we have continued to invest in developing the libraries and tools that enable our customers to port their control code and graphics directly into the latest System 800xA controllers and HMI software. This reduces your risk and cost while preserving and enhancing your intellectual investment. Once in System 800xA architecture, all of the benefits and functionality of an integration system become available to the user, regardless of controller platform. That's the power of integration.

Operator effectiveness

Over a total lifecycle, many important decisions are made by process operators, decisions that have a great impact on safety, productivity and quality. Operator effectiveness can, however, be degraded by control environments characterized by a multitude of different systems, lack of a good process overview and lack of attention to human factors. The challenge is to create an attractive, safe and effective environment with operators in focus and achieve plant-wide integration to increase productivity, energy efficiency and enable consolidated, centralized operations. Such an environment will also attract new-generation operators.

Operator effectiveness
Executive overview

Operator effectiveness is essential but has been neglected

The operational phase of any project is typically the dominant part of the total lifecycle. It is therefore logical to focus on operational efficiency and related economic issues. At the same time, the ever-increasing demand for higher productivity, better quality and increased safety puts more pressure on operator responsibility and performance.

For example, more complex applications in combination with fewer operators supervising larger process areas means more data to interpret and more alarms to process. Lack of continuous training and lack of understanding of human factors and operator involvement, in combination with too much emphasis on technology solutions when designing and planning control rooms, can result in poor ergonomics and dissatisfied staff.

It has become harder to find operators willing to accept this situation and devote their working life to the control room. This problem is compounded by the fact that many of today's operators are approaching retirement, and it is proving difficult to recruit their replacements among the younger generation.

Improved efficiency with more focus on the operator

It's time to bring the control rooms to a new level where operator effectiveness is highest on the priority list. Trends pushing centralization, consolidation, collaboration, remote operations and preventive maintenance, mobility (HMI in handheld wireless devices), simulation and adoption of standards further underlines the need for a different approach to make today's processing visions become reality.

Operator effectiveness
Executive overview – Continued

System 800xA – everything you need to operate more effectively

With System 800xA, users enjoy a fully-integrated enterprise where PLCs, DCS systems, safety systems, live video, maintenance systems, lab system ERPs and more all work together in an seamless environment. The result is improved plant visibility and fast access to relevant information in real time, allowing operational issues to be resolved before downtime occurs.

In addition advanced ergonomics promote alertness and proactiveness further, and the complete control room or control center is optimized according to human factors and operations work flow.
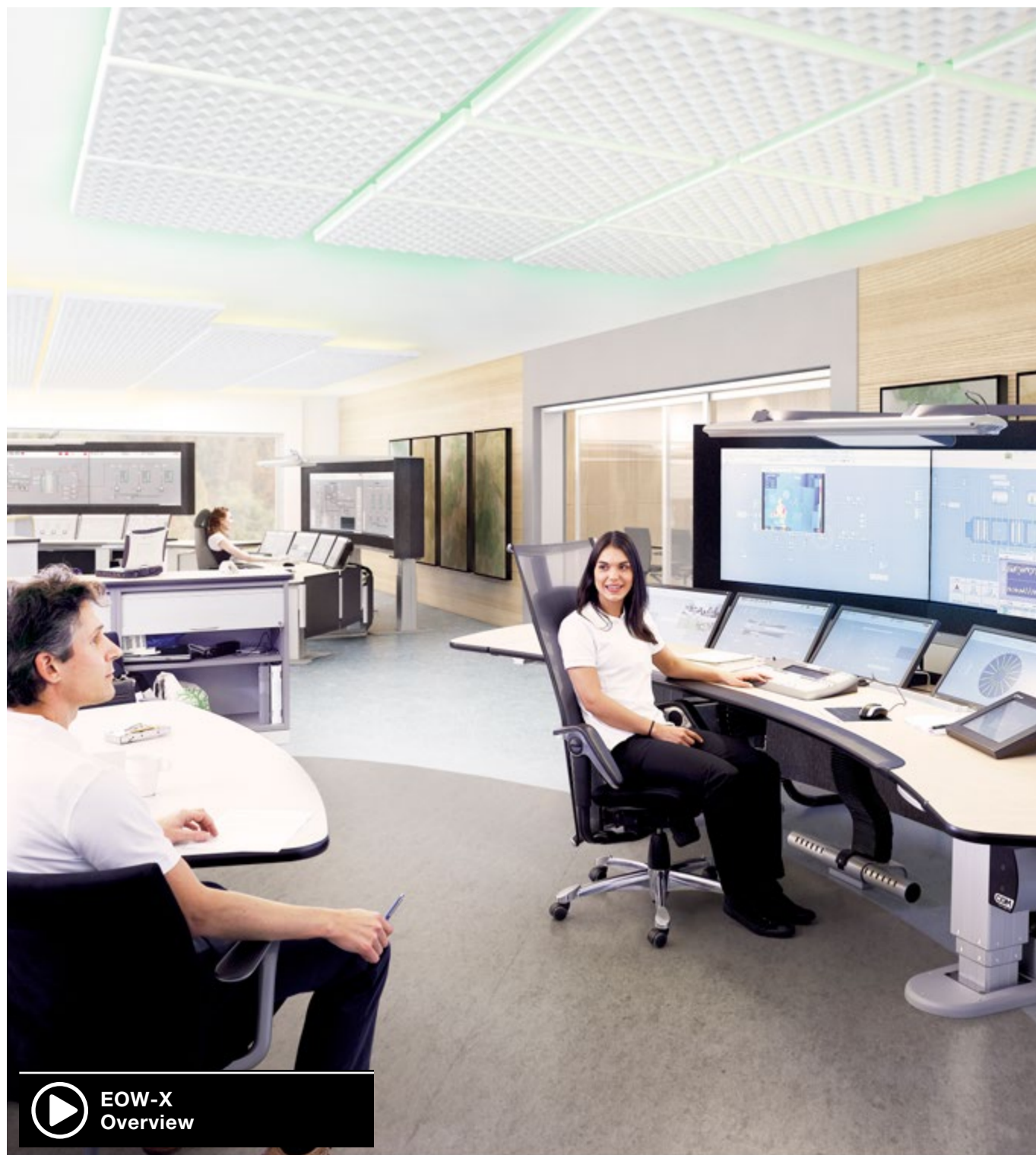
EOW-X Overview

Operator effectiveness
Definition

What is operator effectiveness?
Operator effectiveness is about the operators' ability to supervise and control processes in the most efficient, safe and profitable way.

A number of guidelines, standards and reports give advice on how to design and implement the best environment to maximize operator effectiveness. The main focus areas in operator effectiveness literature are:
– Interaction human-operator interface
– Design of process graphics
– Design of the alarm system
– Design of the operator workplace
– Design of the control room

Some examples of standards and guidelines

EEMUA 191, Alarm systems – A guide to design, management and procurement

ISA 18.2, Management of Alarm systems for process industries

EEMUA 201 – A guide to Design, Operational and Human-interface Issues

ISO 11064, Ergonomic design of control centers

Why is operator effectiveness essential?
Operator effectiveness is a delicate and critical subject attracting a lot of attention. Operator responsibilities, plus the fact that the ever-increasing demands for higher productivity, better quality and increased safety puts even more pressure on their performance, makes this attention easy to understand. Many companies are realizing that improved operator effectiveness is a key success factor for their business.

Roy Tanner ABB Inc.

▶ Operator effectiveness
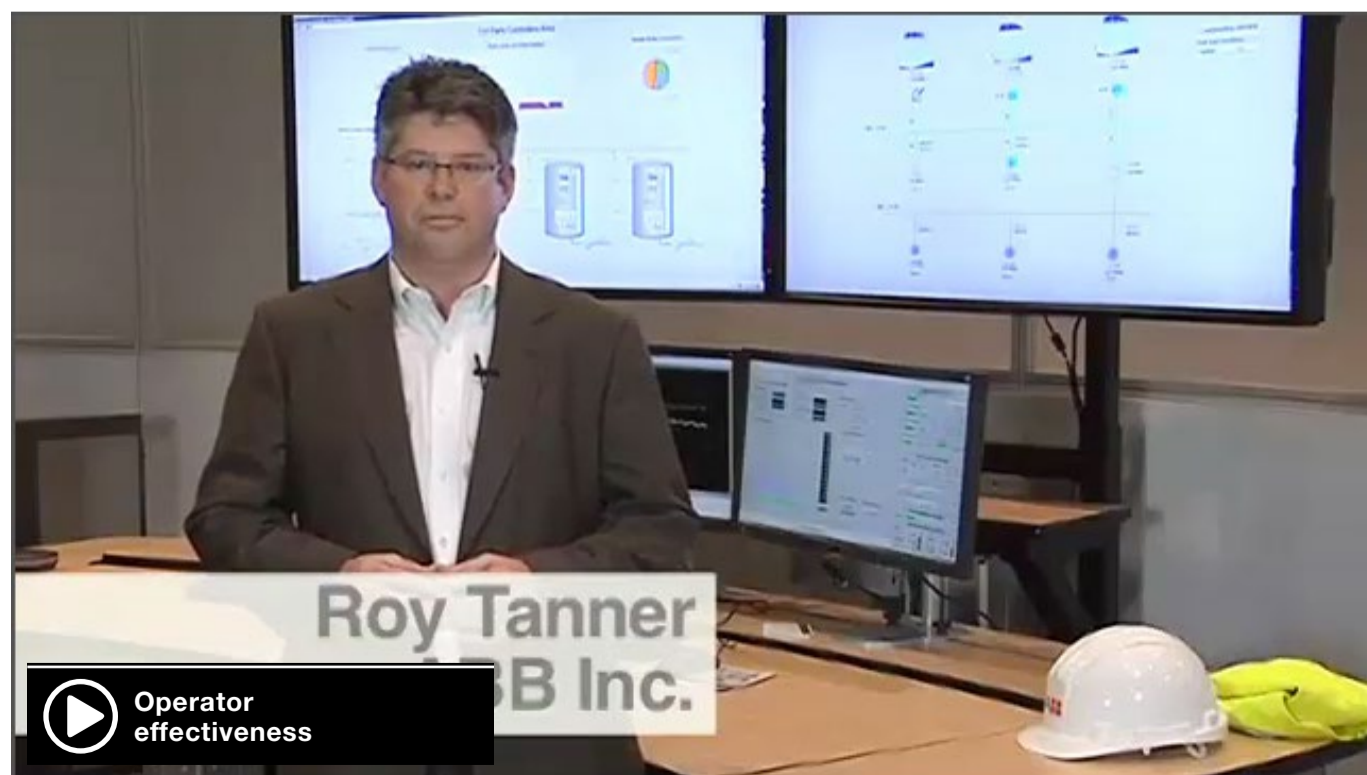
Operator effectiveness
Definition – Continued

Increasing focus on human-centered solutions

Operator effectiveness is clearly more than the DCS system itself. As many examples in the literature show, attention to human factors and workflows in the control room is just as important. What's more, the increasing number of control room consolidation projects, planning of green-field sites with a centralized control center, and difficulties in attracting and keeping operator talent, further enhance interest in this area.

In a report from 2008, the ARC Advisory group described a new trend. "This is part of a trend that ARC refers to as 'Ergonometrics', where increased ergonomics leads to increases in KPIs and metric results. The objective is to offer the operator an attractive working environment with extended functionality and that better enables consolidation and increases collaboration."

Another example pointing to the need to look beyond the DCS system is the report that the ARC Advisory Group published in 2002 introducing a new vision for Collaborative Process Automation Systems (CPAS). The intention was to create an environment in which everyone could access all relevant data in context in a secure way.

For operators, this means that they must have access to all relevant data and tools that help them make decisions and act quickly in relation to the process situation. All data must be synchronized and presented in a unified way, in context, and without the need to login and browse in separate systems. Navigation must be quick and intuitive to avoid delays when searching for data.

To accomplish this, all relevant plant systems (ERP, video, safety, CMMS, etc.) needs to be integrated with the DCS system to enable access to relevant data in context.

Operator effectiveness
Value proposition

Who should care most about operator effectiveness?
All types of process industry must pay attention to operator effectiveness, since it is a major contributor to bottom-line plant performance.

There is also an increasing interest from infrastructure projects that are becoming larger and more complex, and that have demands similar to process industry. Examples include tunnels, traffic control and facility automation.

More specific:
– Process industries in general performing control room consolidations to improve overall effectiveness, profitability and resource utilization
– Industries that are pushed by regulation to improve operator environments, may be both HMI and/or ergonomics
– Industries wanting to adopt standards and align to guidelines
– Industrial sites expanding and building new control rooms, e.g. minerals and mining, power plants, oil and gas
– Industries investing in green-field sites wanting to make sure that operator effectiveness is optimized; oil and gas, minerals and mining, power, etc.
– Remotely located sites that have problems attracting the right kind of operators, and/or sufficient operators
– Industries focusing heavily on safety and availability where operator effectiveness and possibly remote operation are often a critical issue; e.g. oil and gas, power, etc.
– Industries under strong economic pressure needing to rationalize operator staff

Why is it important to focus on the operator?
The control room is the most important room in the facility, where daily decision-making affects corporate goals of operational excellence and a high return on plant assets. Focusing on operator effectiveness has the potential to minimize the risk of accidents, eliminate unscheduled downtime, maximize production and quality, and minimize OPEX (95% of total life cycle).

For example, big losses in process industry are caused by problems in the handling of abnormal situations. According to research, nearly 80 percent of downtime in production is preventable. Half of this is due to operator error. Studies show that the cost for abnormal events is $20 billion per year in the petrochemical industry alone.

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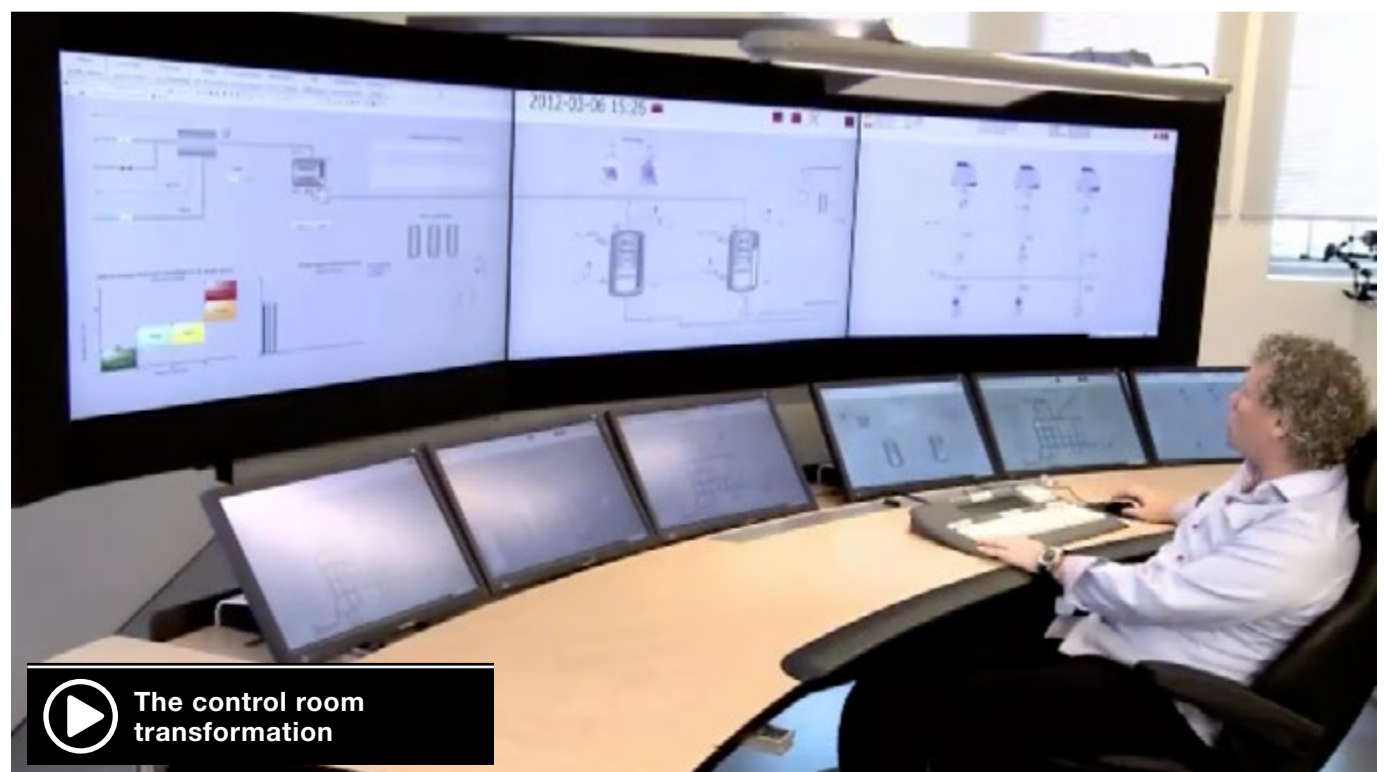## Value proposition – Continued

Improved safety

Implementing advanced alarm strategies reduces nuisance alarms and focuses operator attention on important events. This reduces the risk of hazardous situations arising.

Operator interfaces, workplaces and control rooms designed with attention to human factors promote operator alertness and pro-activeness, which improves situation awareness and abnormal situation handling. Investing in a simulator for realistic and safe operator training improves operator competency, abnormal situation handling, and plant, personnel, and environment safety.

Reduced disturbance and unplanned downtime

Implementation of high-performance HMI guidelines and standards provides operators with an easy-to-use, optimized interface that supports fast operator-process interaction and reduces the risk of disturbances and unplanned downtime.

Providing operators with a good process overview and information easily accessible in context promotes fast and correct decision-making. This reduces the risk for disturbances and unplanned downtime. In the case of an actual disturbance, it will also enable faster recovery.

The control room transformation

Operator effectiveness
Value proposition – Continued

Increasing effective operator collaboration with personnel responsible for the power side of plant operation enables common, plant-wide sequence of events reporting via integrated power and automation with IEC 61850. This makes trouble-shooting of plant disruptions both faster and easier.

Reduced costs for turnover, recruitment and training
Implementing advanced, personal ergonomics has the potential to reduce work-related injuries and subsequent sick leave. An attractive working environment will make operators keen to stay, which reduces costs for the recruitment and training of new operators.

More cost effective operation with fewer operators
Effective consolidation of control systems, process areas and control rooms enables secure supervision and control of larger process areas with fewer operators. This helps reduce both capital expenditures (for control rooms, workplace costs, both SW and HW) and operating costs.

Operator effectiveness
System 800xA Extended Automation
The power of integration

Integrated operations with the operator in focus

With System 800xA, users enjoy a fully-integrated enterprise where PLCs, DCS systems, safety systems, live video, maintenance systems, lab system ERPs and more, all work together in a seamless environment. The result is improved plant visibility and fast access to relevant information in real-time, all of which helps operational issues to be resolved before downtime occurs.

– **Vertical integration** gives operators access to all information relevant to plant operation, e.g. production orders, production reports, financial performance. For example, automatically integrating sales orders with the plant's raw material purchasing, production planning and process control in one integrated flow of information reduces the risk of manual errors and delays, thus improving safety, stability, quality and productivity.

– **Horizontal integration** gives detailed access to all types of devices and all types of control systems, e.g. PLCs, SCADA, DCS, etc. independent of brand, including safety systems.

Operators enjoy a familiar all-in-one process overview with full visualization and common alarm lists that improve the understanding of process events and speed up process interaction, thus improving availability and safety. Consolidation also enables fewer operators to supervise and control larger process areas without comprising safety, thus reducing OPEX.

Integrated info

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

– **Functional integration** makes functions located in separate systems available in the seamless operator environment, e.g. live video, maintenance management, laboratory systems, document management systems and telecom systems.
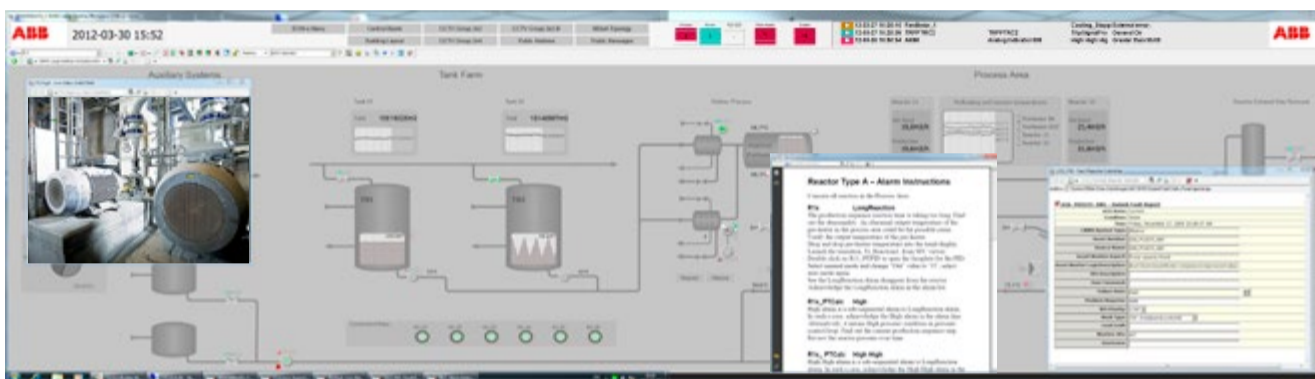
Live Video and CMMS Maximo seamless integrated in the process display

For example, submitting fault reports via an integrated CMMS speeds repairs since maintenance staff receive instant input about which corrective measures are needed, thus avoiding process upsets.
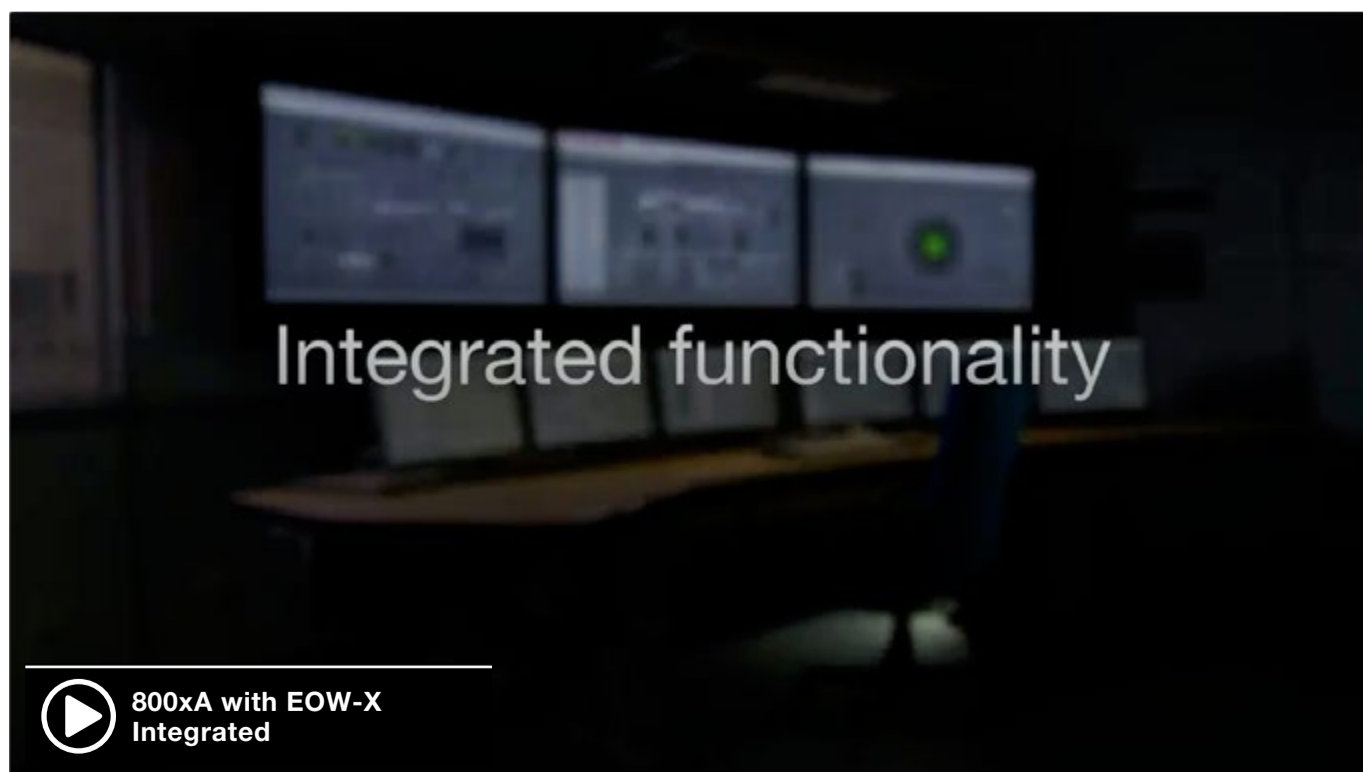
800xA with EOW-X Integrated

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

Integrated documentation gives operators immediate and easy access to the correct documentation for whatever task they want to perform, e.g. instructions and drawings, an alarm instruction, or a planned shutdown. This documentation is directly available for the specific process object on the screen.

Integrated telecom simplifies operator communication and improves collaboration with plant personnel. This facilitates speedy and correct response to plant upsets, especially when plant personnel can also easily share information with each other through an integrated seamless system environment.

Telecoms integration

▶ **800xA with EOW-X Telecoms**

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

Full support for personalized and intuitive workplaces

System 800xA operator station software seamlessly handles multiple screens and large screens, enabling creation of the optimal workstation at all times.

Different users require access to different information depending on their needs. Users can create role-focused work environments with information arranged according to their workflows.

System 800xA operator graphics promote a consistent and easy-to-understand environment where reduced stress and distraction contribute to confident decision-making. Tab-based navigation further enhances ease-of use. System 800xA operator graphics using high performance concepts promote a situation awareness in an easy to understand environment where operators are able to see and comprehend the current state of their responsible area at a glance. Read more about this in our guideline: "Operator workplace and process graphics".
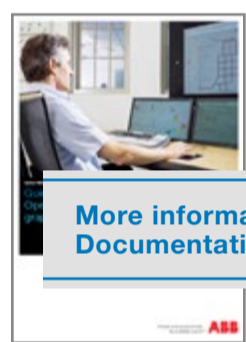
More information in Documentation

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

System 800xA alarm management

An effective alarm system lets operators focus on important events and perform correctly. To help operators see and react correctly to an alarm, the system itself must be pro-active and user-friendly, especially with fewer operators controlling larger process areas.

**Read more about
Alarm management**

The Extended Operator Workplace EOW-x

EOW-x offers unparalleled ergonomics, visualization and communication solutions, streamlining operator work and promoting alert and pro-active staff.

– Large, interactive overview 'owned' by the operators with small personal screens for more detailed information.
– One functional keyboard to control the entire EOW-x that allows operators to work with all EOW-x screens from one place by providing hotkeys for faster and easier navigation.
– Easy-to-use individual ergonomics to support both genders and different physical characteristics. EOW-x workstation contains the latest flexible motorized console technology adjustable at the touch of a button. The smaller screens are also motorized, enabling easy tilting of the screens.
– Built-in support for effective communication. A directional sound system as well as an individual high-frequency dimmable lighting system are both integrated. The console also has a built-in live video camera and speaker system for public announcements.

A fully adjustable environment

▶ **800xA with EOW-X
Ergonomics**

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

Better operating efficiency from reduced working space
Since operators always have personalized, interactive displays close at hand with the EOW-x, the need for 'full-wall, cinema-like' screens is eliminated, which naturally saves many meters in all directions.

These features mean that operators can sit closer to one another yet still enjoy a quite workplace free from distraction. The System 800xA with EOW-x combination is thus a real space-saver. Compared with many older control room solutions, floor space requirements can be cut by a third or more.

Control room design services save time and space
Our attention to operator well-being and efficiency extends beyond the operator workplace to encompass the complete control room and even beyond that, the complete operations center. Together with partners we offer:
– Advanced control building layout with complete scope and all operator functionality considered (2D, 3D and advanced animations in Google SketchUp for fast consensus and saved project time and costs)
– Segmented designs demarcate functions, improve workflow, encourage collaboration, route traffic, induce focus and allow peaceful simultaneity.
– 24/7 fully-adjustable furniture
– Human Factors, Organization and Manning analyses
– Working environment evaluation

A System 800xA at Statoil Tjeldbergodden

Operator effectiveness
System 800xA Extended Automation
The power of integration – Continued

Multi-system integration promotes control consolidation

Multi-system integration makes it possible to supervise and operate several 800xA systems from one central control room in a safe and effective way. Another 800xA function, point of control, increases safety in distributed plants by enabling pre-determined set up of control responsibilities, enabling, for example, smooth shift hand-over to a central control room. This also thus supports consolidation strategies.

High fidelity simulation increases safety

Just as important as giving operators the best possible tools to perform efficiently, operator competence and abilities also have a significant impact on plant performance. With a simulator, operators learn to master the process in a safe and realistic environment.

Summary

Reduced CAPEX: Less workstation clients and HW, reduced control room floor space.

Reduced OPEX: Reduced number of operators, training, turnover and recruitment costs. Increased availability, quality, safety and energy effectiveness.

Operator effectiveness
Key specifications

The trend is very clear: Consolidated, centralized operations where fewer operators supervise and control larger process areas than before. In many cases they are also remote.

Sight angle recommendations in EN 894

Assigning the operator with a greater responsibility in a centralized operation means even more screens with the traditional "low level of integration "approach, and it's a delicate matter not to say, less impossible, to organize them in way that recommendations for ergonomics are met. The problem is further enhanced by the fact that the standard screen resolution 16:9 demands more space than the 4:3.

Make sure recommendations on gaze angles and sight lines for operators interacting with computer screens in standard EN 894 are met.

Control room design according to ISO 11064

When creating a control room for of maximum efficiency it's a good idea to involve specialists that are familiar with recommendations in this area and have adequate competence and practice. A relevant guideline is for example ISO 11064 (covers design principles, control room arrangements and layout, workstations, displays, controls, interactions, temperature, lighting, acoustics, ventilation, and evaluation with the view to eliminate or minimize the potential for human errors).

Effective integration of live video and documentation

To reduce the number of screens and improve operator decision-making, integration of live video and documentation is recommended. Make sure the control system supports this.

Effective alarm system to reduce nuisance alarm

Operator risk being overwhelmed of alarms already in traditional control room, and the risk is of course highly increased in a centralized control rooms since the operators is in charge of larger process areas. It's therefore a must to make sure the alarm system is effective and supports the operator focus and attention.

Make sure the control system support implementation and analysis according to ISA 18.2 and EEMUA 191.

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Key specifications – Continued

Effective consolidation of DCS and PLC systems

To achieve centralized operations, control systems need to be consolidated.

Make sure that the control system has sufficient support to allow this, i.e. that the existing systems, heritage systems of different brands and age, as well as PLC systems are integrated and enable a common, consistent, and easy-to-use interface.

A consolidated control system is also a key enabler in successful vertical integration of business and related systems. Effective integration will also reduce the number of screens and keyboards.

High-fidelity simulator improves abnormal situation handling

Centralized operations put more responsibility on operators; if they are not properly trained, safety could be put at risk.

A simulator where scenarios can be practiced in a safe environment increases operator competence and confidence.

Ensure that the control system supplier can also provide a simulator identical to the real control system for effective operator training.

Operator effectiveness
Solutions details

Integrated operations for centralized operations

800xA is an automation platform, predesigned for effective integration. There are several integration capabilites available:

DCS/PLC systems for horizontal integration and for consolidation of the DCS/PLC layer:

ABB Heritage Systems	Third Party Systems
Advant/Master	Honeywell TDC2000/3000
Mod300	Honeywell Experion
Harmony	Emerson RS3
DCI	Emerson Provox
Melody	Emerson DeltaV
Contronic	Siemens Teleperm M
AC100	Siemens WinCC/PCS7
AC160	Invensys Foxboro I/A
Safeguard	Generic Scada/PLC

In contrast to conventional relational databases, System 800xA has a service-based architecture. This means that a piece of equipment uploaded to it, irrespective of which system it comes from, will be represented as an Aspect Object and be able to use all the services the system can provide.

Information navigation

▶ **800xA with EOW-X
Ergonomics**

Operator effectiveness
Solutions details – Continued

On top of the consolidated DCS and PLC layer, a number of high-value concepts can be applied. Ranging from CCTV video systems to enterprise asset management. Examples of integrations:
– CCTV video systems
– EAM/CMMS maintenance systems (e.g. Mincom, Maximo, SAP, IFS, etc.)
– Document management (e.g. Hummingbird, Documentum, etc.)
– Databases (Oracle, SQL, DB2, etc.)
– ERP for vertical integration and for automating order-to-delivery processes

Operator workplace and graphics guideline
For more details and advice regarding how to set up operator workplaces and design the actual operator interface utilizing 800xa functionality, please see the document operator workplace and graphics guideline.

EOW-x comparison with sight angle standards and related issues of operator ergonomics
For details about how EOW-x meets and even exceeds recommendations on sight angle etc standards in EN 894, please see the document EOW-x.
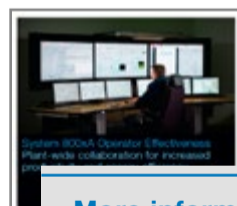
More information in Documentation

Operator effectiveness
Testimonials

Boliden Aitik open pit copper mine invested in 800xA snapshot reports and integration of the documentation system, maintenance system and power, the later via IEC 61850

"The Boliden vision is to create operator environments that are easy to use and where valid information is not more than a couple of mouse clicks away", says Mikael Walter, Manager at the Boliden Process IT technical department. "All together, we are very satisfied with the choice of 800xA and the co-operation with the local ABB organization. Our common efforts made the Aitik36 system what is today."

Benefits

– Ease of reporting – operators now log maintenance fault reports directly at their 800xA interface with just a few clicks. In the old plant, this was a complicated and time-consuming process and as a result, operators didn't report all the faults they observed.
– Increased fault reporting - since integrating its maintenance system in System 800xA, Boliden Aitik has increased its fault reporting a dramatic five-fold.
– Efficient decision-making – maintenance staff receives correct information and can take action immediately
– Reduced downtime – the risk for production interruptions and unplanned shutdowns is greatly reduced.
– A more precise distribution and follow-up of maintenance costs since these are now reported according to the object that incurred them. This makes it much easier to compare the performance of machinery with the aim of optimizing operating costs.
– Fast and correct action - integrated documentation, e.g. drawings, operator instructions and security instructions, gives operators instant access to correct documentation directly on the screen in front of them.

Statoil, Tjeldbergodden, a major producer of methanol, invested in EOW workstations and integrated live video to improve operations

"The operators, 30 in total, are extremely happy with the EOW, and naturally so are we. As several people can comfortably participate in trouble-shooting at the same time, the large displays also speed up error recovery", says Stein Holsen, process control engineer at the plant. "Thanks to video integration, we are able to monitor and control vital processes and integrate images with process graphics on the operator monitors."

Automation and power integration

Leaders in the process control industry have continually expressed the need for increased operational efficiency, reduced downtime, and reduced energy consumption. To meet these needs, a true integration platform is necessary in order to tie together the electrical control system, process control system, and maintenance equipment health information so that managers and operators can make informed decisions on energy and lifecycle management.

Automation and power integration
Executive summary

Barriers and past attempts to integrate electrical systems

Electrical integration in the past has been hampered by a lack of communication standards and architectural design that has resulted in high project execution, commissioning and lifecycle costs. Substation Automation (SA) systems use too many protocols. Some are proprietary while others are open standards. Not one protocol has become dominant. As a result, the cost of engineering of the SA system is high, since multiple vendors supply equipment that uses different communications protocols. The lifecycle costs of a system with a jumble of communication links are also very high.

Electrical Integration is not new. It has been done in the past by hard-wiring signals between the electrical equipment and the process control system, as well as by building complex software gateways. The result is still two separate systems, but they are at least tied together. This traditional methodology has high integration costs, high project risks, and high lifecycle costs.

Organizational barriers among departments within plants and suppliers have also hampered integration efforts. A new approach is needed to overcome these barriers.

The solution is right in front of you!

Integrate process and power automation in the same plant control system. One single automation environment unifies the control of process-related equipment as well as the protection and control of high/medium voltage equipment.

Full plant integration with ABB and System 800xA

With integrated process and power automation, ABB's System 800xA provides full plant integration. ABB's electrical integration is based on open standards. ABB offers a complete portfolio of DCS, process electrification and substation automation solutions that reduce project costs and risks.

Automation and power integration
Definition

What is integration of electrical systems?

Integration of electrical systems is the ability to control and monitor the electrical system from one common plant control system. Until now, the traditional approach has been separate systems for substation automation and process control. Substation automation systems protect, monitor and control substation equipment. The process control system protects and controls low voltage switchgears, motors and drives. Information sharing between the systems is required in order to run the plant in a efficient way. A lack of standards has made this costly and difficult to maintain.

Integration of electrical systems is the next frontier in driving energy efficiency, increasing availability and operator effectiveness, and reducing costs. One single automation environment unifies the control of process-related equipment as well as the protection and control of high/medium voltage equipment.
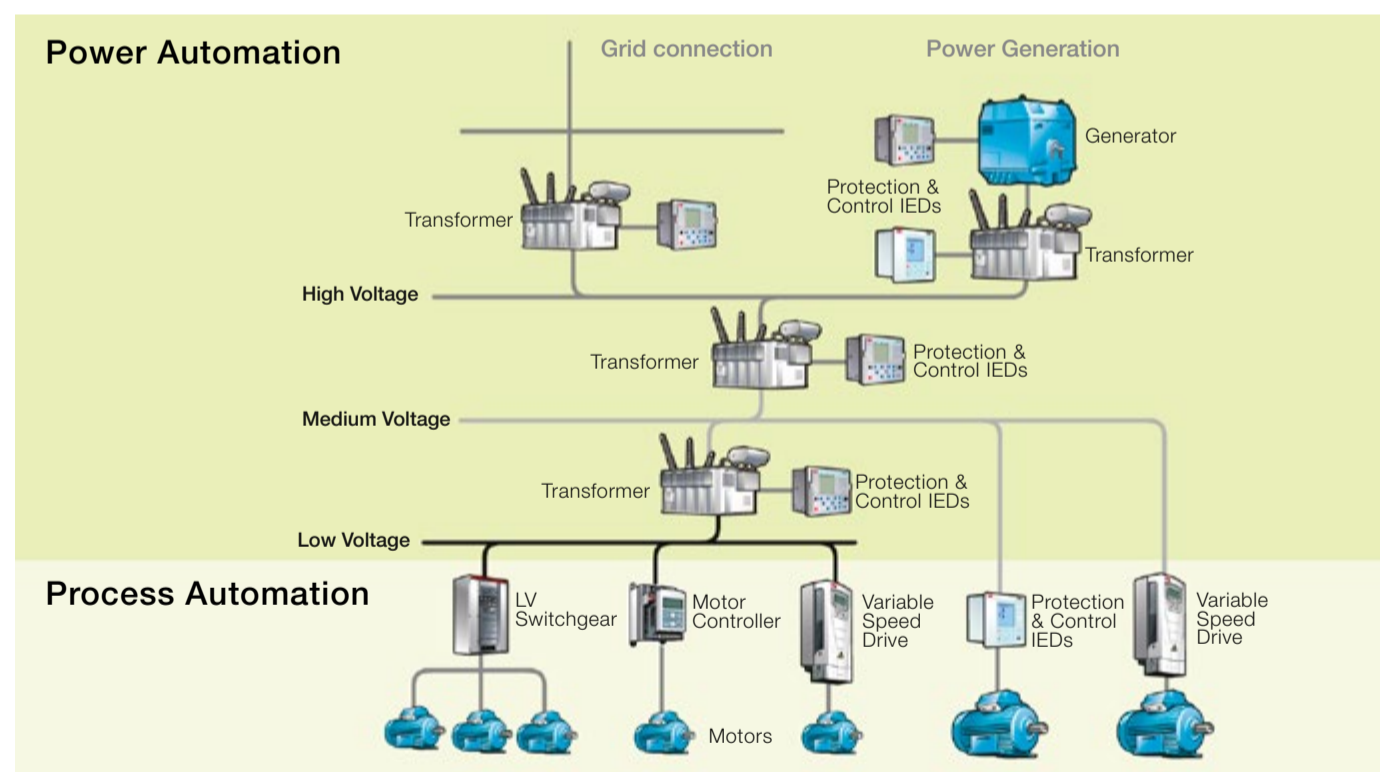
The difference between process and power automation seen from the electrical components in the plant. Here we see a general diagram of the electrical feed to a plant. It can be done through a grid connection or in-house power generation. The power is transformed to lower voltage levels and finally fed to the different consumers in the plant. From an electrical point of view, Process Automation means control and monitoring of low voltage equipment, e.g. different types of LV switchgears, motor control centers or Variable Speed Drives. This is process electrification. Power Automation means the distribution of the power, in-coming or out-going, i.e. protection control and monitoring of the substations. The devices that are the interface to the substation equipment are usually Protection & Control IEDs (Intelligent Electronic Devices).

Automation and power integration
Definition – Continued

What is IEC 61850?

IEC 61850 is an Ethernet-based global standard for communications and system architecture in substation automation and power distribution systems. It is a standard defined by the common work of both ANSI (N. America) and IEC (Europe) together with main vendors in the substation automation market such as ABB.

IEC 61850 has a standard data modeling and naming convention for IEDs, and a common language to configure the devices, thereby providing interoperability between devices as well as engineering tools. The standard has a flexible and open architecture, enabling freedom in configuring the IEDs according to application needs. IEC 61850 standard specifies two main types of communication; vertical communication between the control system and the IEDs based on MMS, and horizontal communication from IED to IED based on GOOSE (Generic Object Oriented Substation Event).

Furthermore, as IEC 61850 is able to follow changes in communication technologies, the standard can be considered future-proof.

Automation and power integration
Value proposition

Who should care most about automation and power integration?
Industries that are sensitive to power consumption and maintaining production during peak usage times are the most interested in electrical integration.

Oil & gas and mining
– Maximize production – keep the process running with reliable power supply
– Load-shedding during power interruptions
– Optimized utilization of generating capacity

Pulp & paper, aluminium & steel, power generation
– Manage electricity as a raw material cost
– Peak-shaving, address high energy consumption
– Reliable supply

Reduces operational costs
With electrical and process operations combined in a unified environment, operator effectiveness improvements, reduced spare parts and training, as well as better inter-department operations can be realized. While the exact amount that a unified environment will save will vary from site to site and industry to industry, any improvement in these areas can impact and create both direct and indirect savings.

Increases operator effectiveness
With a single plant-wide system, troubleshooting plant upsets can be

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easier and faster. A common plant-wide sequence of events (SoE) list is made available by the integrated system. Time-stamped event resolution is 1 ms with IEC 61850. No longer will process control and power engineers need to attempt to match non-synchronized event lists from multiple systems. By utilizing the electrical integration architecture, operators can now begin saving money and increasing uptime throughout the plant.

Reduces down-time
An integrated systems approach allows enhanced power management. For example, load-shedding applications are easier to design and take less time to implement and commission. When the application is embedded into the controller, it can respond more quickly to power glitches, which increases plant uptime by preventing black-outs. See section 'Improved power control and availability' for details.

Improved power control and availability

Reduces energy costs
An integrated system enables operators to understand and easily access power usage. New energy saving opportunities can be explored, while existing energy reduction programs can be enhanced. For example, an increase in power consumption by a unit or an area can indicate equipment malfunction and wear. ARC believes that in many cases, the potential energy savings can equal 10% of the total consumption.

Optimize maintenance strategy
Electrical Integration architecture provides operators and maintenance personnel with current process information along with instrumentation and electrical asset information. It creates a centralized maintenance system with actionable data to predict equipment failure and increase plant availability.

Reduced investment costs
Integration of electrical systems provides one common system for both DCS and electrical SCADA. This reduces the footprint as well as the investment cost. Duplication of equipment such as servers, workstations and spare parts is no longer needed.

Hard-wired communication and complex software gateways can be eliminated with an Ethernet-based IEC 61850 communication solution, which significantly reduces wiring costs.

# Automation and power integration
System 800xA Extended Automation
The power of integration

What value does System 800xA provide?

With integration of electrical systems, ABB's System 800xA provides a unified integration of all plant equipment and systems. In the investment phase, this lowers project costs and risks and reduces project cycle times. In the operational phase, better visibility improves collaboration and maintenance strategies, which significantly reduces operational costs.

Full plant integration

By integrating Substation Automation and Process Electrification into System 800xA, ABB enables full plant integration.
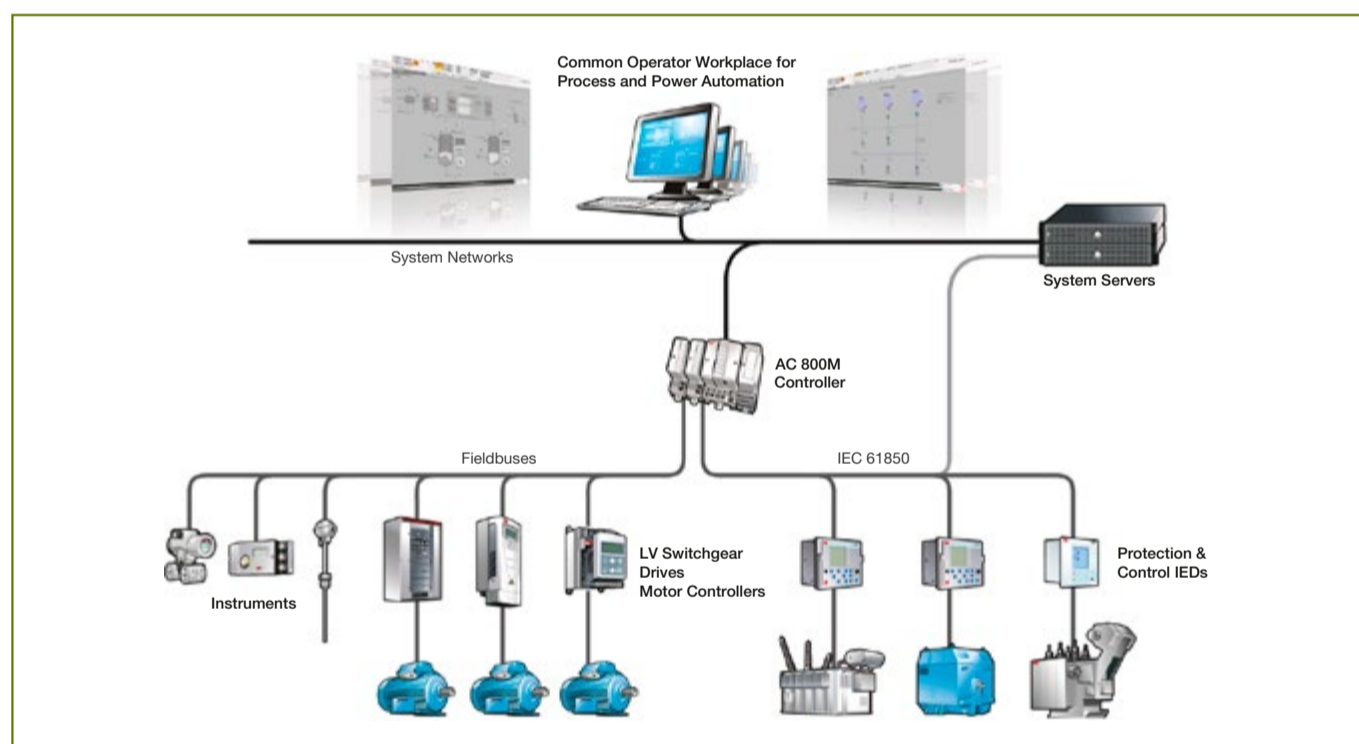
Based on open standards

By taking advantage of Industrial Ethernet, System 800xA fully supports the global IEC 61850 standard. It provides interoperability between devices for cost-efficient integration.

System 800xA also supports Fieldbus technologies such as PROFINET and PROFIBUS for the process electrification area. System 800xA has extensive integration with PROFIBUS for efficient engineering and maintenance. With PROFINET, which has a wider bandwidth than PROFIBUS, even more advanced integration of process electrification is available. PROFINET is based on Ethernet.

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System 800xA Extended Automation
The power of integration – Continued

Reduced investment costs

System 800xA offers the most cost-effective way of integrating electrical systems:

Reduced system footprint through one common system for both DCS and electrical SCADA. This reduces the initial investment cost as well as system maintenance costs. Extensive wiring is replaced with Ethernet protocols (e.g. IEC 61850), which results in cost-effective installation and flexibility in terms of system extension.

One common system reduces overall maintenance costs such as training and spare parts, and enables predictive maintenance strategies.

Collaborative environment reduces downtime

System 800xA is the most powerful operations system on the market, allowing industrial plants to benefit from consolidated control rooms that enable collaboration between all users in the plant. With integrated electrical systems, both process and power group operators enjoy total plant visualization. Operators now have full insight into the effects that power automation systems have on the process control areas and vice versa. The result is increased availability and faster as well as easier trouble-shooting.

Optimized asset management and maintenance strategies

The 800xA unified integration of all plant equipment also enables one common asset management strategy throughout the plant. The engineering workplace allows fast and easy access for configuration, parameterization and commissioning of devices during engineering and startup. During operations, detailed diagnostics from the devices can be retrieved at any time. The next level of asset management is automatic condition monitoring, which enables condition-based maintenance. This is the key to improving maintenance strategies and reducing maintenance costs. The unified integration of all plant equipment enables detection of early warnings from malfunctioning equipment. This gives the maintenance staff one single view of all plant assets, including process instrumentation, process electrification and medium voltage (MV) and high voltage (HV) equipment.

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System 800xA Extended Automation
The power of integration – Continued

Improved power control and availability

System 800xA has been widely used as an integrated or stand-alone Power Management System (PMS). The main purpose of a Power Management System is to keep critical loads running and avoid blackouts in industrial plants. This is especially relevant for in-house generation, or when the supply from the electrical grid is insufficient.

System 800xA power management solutions include:
– Object control - daily operation of electrical equipment like generators, transformers and breakers.
– Power control - control of power generation from several in-plant generators and power sharing with other grids and/or plants.
– Load-shedding - keeping critical loads running during limited in-plant generation (e.g. a generator trip) and/or insufficient grid supply.
– Synchronization - phase synchronization to other plants and/or grids and bus-tie operations.

Automation and power solutions from ABB

ABB's solution includes DCS, substation automation, process electrification integration and services. As the market leader in DCS, ABB's System 800xA is a competitive and complete DCS system intended for all types of industrial automation. ABB is also market leader in products for substation and distribution automation. The ABB Relion protection and control IEDs are designed for native IEC 61850 functionality. ABB leads the market in the process electrification area with intelligent LV switchgears, motor controllers and drives.

A wide range of project management and product services for installation, maintenance and operations are also available from ABB across the globe.

Finally, ABB has the unique capability of being both the main electrical contractor (MEC) and main automation contractor (MAC). As the MEC/MAC, ABB has better control over the system design, which streamlines project management by minimizing time-consuming coordination among multiple suppliers. This results in lower project risks and fewer schedule overruns, as well as reduced risk for system integration problems.

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Key specifications

Specifying integration of electrical systems

Today's demands on productivity and energy efficiency require a control system platform that allows integration of both process automation and power automation. Compliance with the IEC 61850 standard makes the integration of electrical systems cost effective and flexible for future extension and modifications in the system.

Standards and certifications

– Substation automation based on the IEC 61850 standard.
– Native IEC 61850 integration to the process control system, including both vertical and horizontal communication.
– KEMA-compliant interface to IEC 61850 network.

System specifications

– One single operator interface for process automation and power automation.
– Seamless control capabilities from DCS controller, i.e. GOOSE+MMS interface to IEC 61850 networks.
– Common time synchronization for process control and substation automation to enable one single SoE event list.
– Standard products for power management systems with flexible and proven solutions for load-shedding applications.

Integration

Substation automation is a separate discipline compared to process automation, and integration of electrical systems requires specific knowledge in power automation. It is highly desirable that the system vendor and integration group have extensive knowledge of power products and power automation.

Automation and power integration
Typical applications

System 800xA as electrical SCADA system for process industries

ABB's System 800xA supports native IEC 61850, thus enabling seamless integration of substation equipment. This allows all operators to control and monitor both process equipment and substation equipment from 800xA workplaces. 800xA acts as an electrical SCADA system, but with full integration and visibility to process control as well. This solution mainly uses vertical IEC 61850 communication. It provides daily operation of substation equipment and enables condition-based maintenance strategies as well as a platform for energy efficiency initiatives.

Seamless control applications in AC 800M for control, interlocks and power management

With integrated electrical systems, power management and load-shedding applications are easier to design and take less time to implement, commission, and maintain. ABB's load-shedding application can respond to power interruptions more quickly by taking advantage of AC 800M as an IED. Since AC 800M now acts as an IED, it communicates horizontally with other IEDs via GOOSE. With GOOSE, load-shedding signals are sent among IEDs in less than 40 ms. Without electrical integration, users would have to hard-wire or build complex software gateways between the electrical devices and the controller. The latter method is very expensive to build and difficult to maintain in the long term. Integration to 800xA simplifies the overall design, which lowers engineering, implementation, training and maintenance costs.

Automation and power integration
Testimonial

Petrobras lowers lifecycle costs with System 800xA and IEC 61850
Petrobras is an energy company that serves Brazil and abroad with over 100 platforms, 16 refineries, and 6000 gas stations. Its vision is to be one of the five largest integrated energy companies in the world, and it is investing heavily over the next five years to improve and streamline its infrastructure.

Challenges
Petrobras faces many challenges as it expands its substation automation (SA) infrastructure. The company needs to integrate new substations with legacy power management systems (PMS). PMS functionality and data need to be shared with both the new and legacy systems. At the same time, Petrobras is looking for better performance, reliability and system information.

ABB's solution: IEC 61850 Connect
Petrobras implemented ABB's System 800xA to provide a unique and open concept with one IED technology, one library, one control system, and one common IEC 61850 engineering toolset. This solution adds value to the actual assets for the total lifecycle.

Integrated safety

In the hierarchy of automation, safety automation is a tier above normal process control. Whether the process is continuous, discrete, or somewhere in between, safety automation can be found in most facilities. It is critical to protecting people, the environment, and the financial investment in the facility should normal control fail to keep the process within safe operating parameters.

Integrated safety
Executive overview

What is safety automation?

In the hierarchy of automation, safety automation is a tier above normal process control. It is critical to protecting people, the environment, and the financial investment in the facility should normal control fail to keep the process within safe operating parameters. Due to these demands, safety automation has special requirements relating to how it must be addressed throughout the project lifecycle. IEC, ISA and other standards address the complete lifecycle of safety automation from equipment design and manufacturing to the complete project lifecycle that must be managed by process owners.

Critical needs of the market

Critical needs of the safety system market have changed over the years following the first wave of implementation after the major incidents of the late 70's and early 80's (e.g. Bhopal, Mexico City and Piper Alpha). In recent years, attention has been refocused on safety due to incidents such as the explosion at the Texas City refinery. Current trends include:

– Global acceptance, implementation, and enforcement of safety standards.
– Economic growth of heavily-regulated industries.
– Increased safety awareness after major incidents.
– Aging of automated safety platforms and infrastructures.
– Capacity expansion and upgrade of existing plants.
– Change in attitude towards safety systems from costs to savings.

From a safety system supplier perspective, the main requirements include TÜV certification to SIL2/3, integration with DCS systems, a complete portfolio of TÜV certified sensors and final control elements as well as high availability and functional safety management services and certified implementation centers.

ABB's safety automation solution

ABB's System 800xA High Integrity safety solution provides a flexible integrated architecture for all types of safety applications. Together with our industry leading lifecycle services, we can supply everything needed for a certified safety solution in every area of the world.

Integrated safety
Process safety system history

ABB was there at the beginning

Process safety automation began many years ago by using 'hardwired' relay systems. These ranged from very simple to complex electrical circuits that were separate and very difficult to test and maintain. ABB was among the originators of process safety systems in 1979 in response to market needs following a serious accident in 1976 at Seveso in Northern Italy.

ABB released the Safeguard 9000 system in 1983 as the first integrated safety system, and it was activated in 1984 on the Gullfaks A platform in the North Sea. ABB has been a leader in integrated safety systems since that time.

Twenty-five years later in 2009, ABB was celebrating its 30th year in automated process safety. A key milestone occurred in June, 2009, when the first SIL3 System 800xA High Integrity system went into full operation on the worlds largest offshore platform, the Statoil Troll A platform in the North Sea.

As well as the early Safeguard 9000 and the most recent System 800xA High Integrity SIL3, ABB has a proud history of safety automation platforms:
– Safeguard 3000, released in 1993
– Safeguard 400, released in 1997
– Plantguard, released in 2002
– Triguard, released in the 1980s
– System 800xA High Integrity SIL2, released in 2005
– System 800xA High Integrity SIL3, released in 2008

Like other parts of ABB's automation offerings, most of these platforms are still supported today. For those systems that have or will soon reach their end-of-life support dates, ABB offers evolution paths into the System 800xA High Integrity platform to make the upgrade as easy as possible.

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Integrated safety
Definitions and terms

Terms, words and phrases you may need
– Safety: freedom from unacceptable risk.
– Risk: a combination of the probability of occurrence of harm and the severity of that harm should it occur.
– Functional Safety: The part of overall safety that depends on a system or equipment to operate correctly in response to its inputs or demands.
– Safety Instrumented System (SIS): a system comprising sensors, logic solvers and actuators for the purposes of taking a process to a safe state when normal predetermined set points are violated.
– Safety Instrumented Function (SIF): functions that have to be performed to reduce risk to an acceptable level.
– Probability of Failure on Demand (PFD): the probability that an individual component will fail when a demand to perform its required function is required.
– Safety Integrity Level (SIL): a defined level of risk reduction or probability of failure on demand that are tied to the possibility of damage to property, environment, and human life.
– Reliability: the likelihood that a function will be performed when the demand for the function is required.
– Availability: a measure of the probability that a safe failure will occur without a demand.
– Spurious Trip Rate (STR): occurs as a result of a diagnosed failure within the safety system; not from a process demand. STR is the statistical fraction of time that a spurious trip could occur.
– Architectures terms (general):
  • Simplex: a single logic solver.
  • Dual Modular Redundancy (DMR): redundant configuration of I/O processing and logic solvers.
  • Triple Modular Redundancy (TMR): a configuration of three parallel I/O processing and logic solving components.
  • Quadruple Modular Redundancy (QMR): Often viewed as 2oo4 architecture, but implementations are commonly only 2 I/O processors and the 4 logic solvers are grouped in 2 pairs such that the system operates with a hardware fault tolerance of 1.
– TÜV: (Technischer Überwachungs-Verein): a Germany-based testing/certification/training group of companies recognized as one of the premier authorities on safety.
– Exida: a safety testing/certification/training company recognized as one of the premier authorities on safety.

Integrated safety
Definitions and terms – Continued

- Safety standards:
  - IEC 61508: international standard that applies to the design and manufacturing of process safety equipment.
  - IEC 61511: international standard that applies to the application of process safety within a facility.
  - ISA84: adopted IEC 61511 for the application of process safety. The one key difference is that ISA84 contains a 'grandfather' clause allowing existing, unmodified systems to remain in use.
- Architectures: a shorthand to describe the required number of components that must 'vote' on a demand and the maximum number of components available (1st number is voting, 'oo' stands for 'out of', 2nd number is maximum processors, and a 'D' denotes available supporting diagnostics).
  - 1oo1: a single processor and only it takes action. Generally low availability with high STR.
  - 1oo1D: also low availability (STR) but slightly better reliability (higher PFD).
  - 1oo2: high reliability architecture with two processors both capable of taking action. Relatively low availability.
  - 1oo2D: nearly the best overall architecture statistically. 'Best' safety choice, nearly the lowest STR.
  - 2oo2: best availability, but worst choice for PFD.
  - 2oo2D: nearly best availability, and only slightly better PFD than 2oo2.
  - 2oo3: often ignorantly considered 'the only choice to really be safe', it ranks nearly the best in PFD and nearly the best in STR.

What you need to know about safety system architectures
Historically, architecture has been equated to SIL capability with redundancy like TMR and QMR always seemingly required for SIL3. But System 800xA High Integrity meets SIL3 in a simplex design. This demonstrates that what should really be the key concerns for the system owner is (1) hardware safety integrity, (2) safe failure fraction, and (3) the behavior of the system following the detection of a fault. System 800xA High Integrity performs best in all three areas.

Integrated safety
Value proposition

Who should care most about integrated safety?

– Control system designers
– Plant operations
– Plant management
– Safety automation engineers

> Typically, the engineering groups responsible for DCS design will drive this technology.

Reduced capital costs

An integrated system can reduce capital expenditure by delivering the synergies of one single system and avoiding duplicating the networks, operations interfaces and licensing, configuration training and maintenance of two separate systems.

Operational excellence

Familiarity with everything from interacting with graphics and managing alarms to performing system maintenance eliminates problems that often occur when process control and safety are truly different systems. Everyone dealing with the system performs their role better with integrated process control and safety automation.

Common security model

Everything from user login to features that include user log-over, user privileges within process areas, user action validation, and common audit trail for all events greatly simplifies system management and system design. The model is then extended with specialized safety features that include SIL access control and authorization, force control – override control – bypass management, confirmed online write and confirmed operation; all part of a safety firewall and procedural control security designed to meet the most stringent SIL3 needs.

Common tools reduce costs

A common engineering environment for process and safety application development reduces the training costs and costs connected with troubleshooting and problem solving that are inevitable when using different systems and different software packages.

Integrated safety
System 800xA Extended Automation
The power of integration

System 800xA High Integrity is an innovative development in safety automation and a prime example of ABB's power of integration. System 800xA HI provides the opportunity to fully integrate safety automation into the process automation environment in ways unmatched by any other supplier.

S a f e t y

▶ **An integrated approach to process safety**
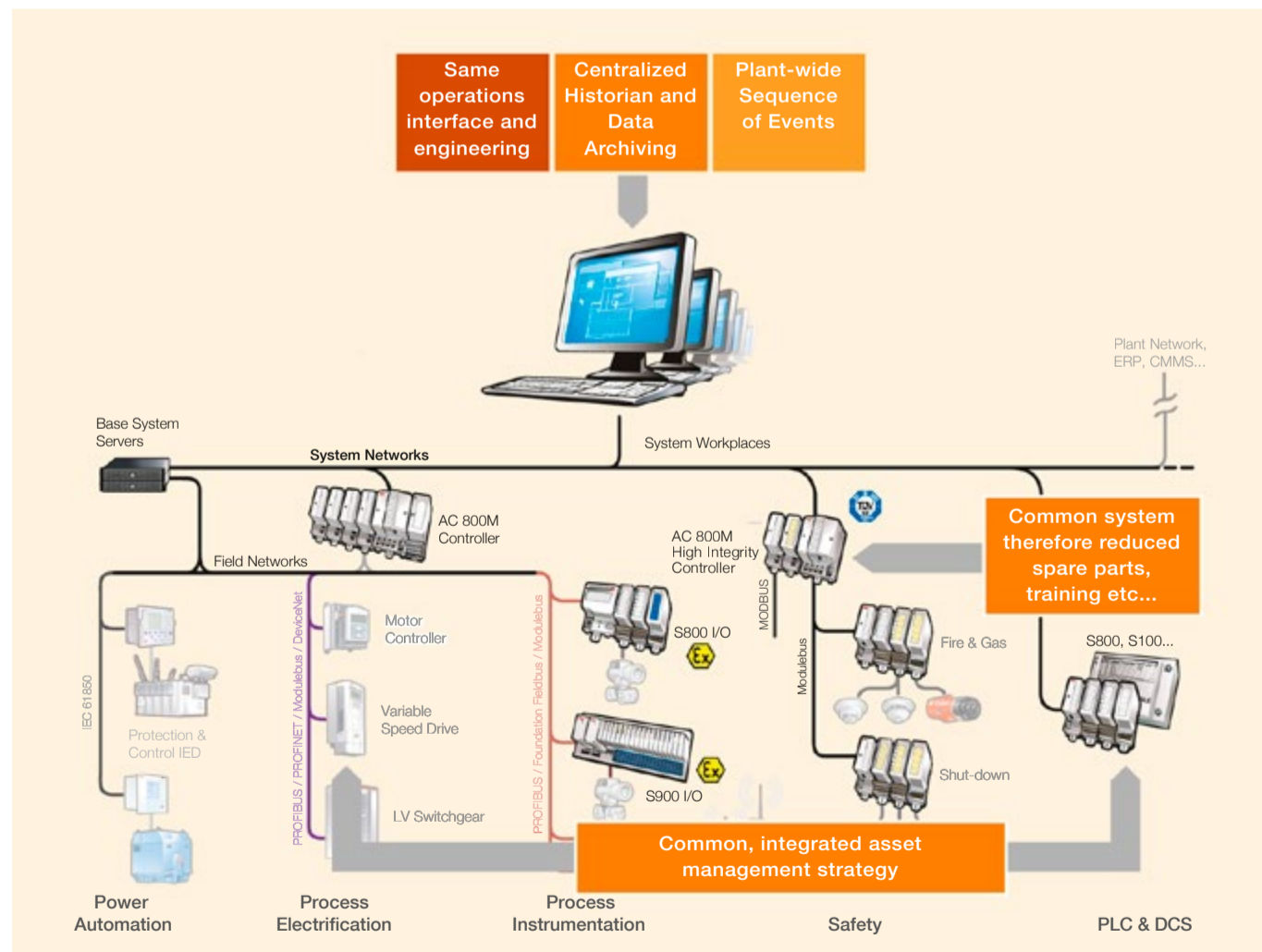
Integrated safety
System 800xA Extended Automation
The power of integration – Continued

High Integrity with flexible degree of integration

The primary benefit of System 800xA integrated architecture is the freedom to choose the degree of integration appropriate for a specific application and control philosophy.

System 800xA HI can be:
– 1) Deployed as a fully-segregated solution, integrated at the same plant network level as process automation.
– 2) Integrated into the process control system but using dedicated safety controllers on the same control level network.
– 3) Fully-integrated with both process control and safety automation executed simultaneously within the same controller hardware.

This architecture enables users to get the full benefit of integration (common history, sequence of events, asset management, spare parts, training, engineering and operator interface) while still meeting the required safety standards.

Integrated safety
System 800xA Extended Automation
The power of integration – Continued

Extended security to meet stringent SIL3 needs

System 800xA HI meets the most stringent IEC 61508 requirements for products to satisfy and increase overall safety reliability for safety integrity level (SIL) applications to SIL3. It can also be used to meet safety requirements under NFPA, EN ISO 13849-1 (formerly EN 954-1) for machine safety, and most other safety standards. No other safety automation solution in the marketplace is more flexible than System 800xA High Integrity.

This architecture enables users to get the full benefit of integration (common history, sequence of events, asset management, spare parts, training, engineering and operator interface) while still meeting required safety standards.

This architecture enables users to get the full benefit of integration (common history, sequence of events, asset management, spare parts, training, engineering and operator interface) while still meeting the required safety standards.

The three pillars of safety automation

Early implementations of safety control were done with hardwired relays and switches. Regardless of the technology of the process control system, safety systems were always independent, separate and diverse from process control. These three distinctions have grown to be the pillars that process owners and standards creators focus on; independence, separations and diversity. As integration increases, it begins to infringe on the separation portion of the requirements. The challenge for automation suppliers is to retain as much of each pillar as possible while expanding the benefits of integration.

Many process owners will still assume that the only way to meet the three requirements is when the process and safety systems come from different suppliers or at least from distinctively different product lines. This is not true. TÜV has certified 800xA HI as meeting the SIL3 safety requirements even when designed with process and safety automation inside the same controller.

Integrated safety
System 800xA Extended Automation
The power of integration – Continued

Why System 800xA HI architecture is best

System 800xA High Integrity excels in all of the key categories that are important for safety system selection:

– Low PFD equivalent to the long-accepted TMR benchmark standards in either simplex or redundant configurations.
– Low STR that meets or exceeds the long-accepted TMR benchmark standard when implemented in dual configuration.
– Exceptional hardware fault tolerance in dual configurations. The independence of the safety modules (SM) from the logic solvers (PM) is a key feature of the design (see later).
– Availability that has been estimated as high as 99.9999%.

CAPEX and OPEX savings

System 800xA High Integrity is a component of the overall system, which means that the history, asset optimization, operator interface, engineering tools, and even network are the same and TÜV-certified. This reduces initial capital expenditures and subsequent maintenance costs.

More secure and maintainable

In addition to common System 800xA features such as user authentication, user privileges, log-over and audit trails, System 800xA High Integrity has SIL access controls, bypass management, and confirmed on-line writes specifically designed for safety installations. This reduces the need for custom code and handshaking routines, which are hard to maintain over time.

Reduced training and cross training opportunities

The same tool used for System 800xA Basic Process Control applications (Control Builder) is used for System 800xA High Integrity. A common knowledge base can therefore be used and owners are not restricted to the person(s) 'who know the safety system' being available should the need arise. Having the same engineering tool also improves collaboration and operations since more plant personnel understand how the various systems work together. System 800xA also provides library elements that are clearly labeled for use in a safety program to ensure proper SIL ratings of solutions.

Integrated safety
System 800xA Extended Automation
The power of integration – Continued

Safer operations
Having the SIL application and BPCS integrated in the same system makes it easy to take advantage of unforeseen opportunities such as sensor validation. Trends that can compare SIL and BPCS signals to validate instrument health are easily created. This gives operators better decision support.

Even TÜV recognizes that System 800xA HI is unique!
TÜV Certification section 2.7 Architecture states: "AC 800M High Integrity controller is certified up to SIL3 in a single configuration which from CPU point of view contains one PM865 and one SM811 unit working in a functional pair. Redundancy of these units is not required for achieving or maintaining the safety integrity. Redundancy of the 800M High Integrity can however be arranged by using two PM865 and two SM811 units in a quad(ruple) structure (i.e. four CPUs) to achieve better system availability. Redundancy increases system availability using SIL2 or SIL3 system configuration. Adding redundancy does not affect safety integrity, it only increases availability.
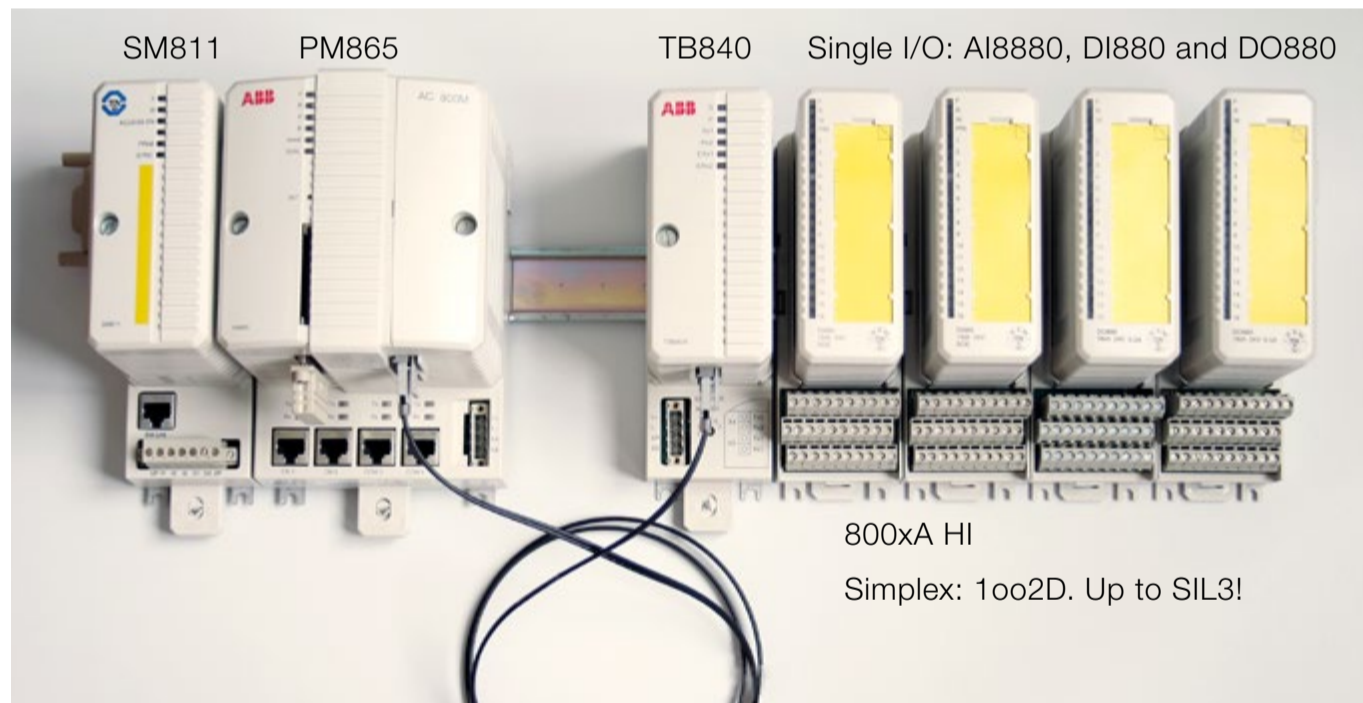
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System 800xA High Integrity safety system

System 800xA HI's safety offering includes:
– Unified and flexible high integrity system architecture
– TÜV-certified SIS solution including controller, communications modules, digital and analog I/O modules with complete diagnostic capabilities
– Integrated engineering environment
– Personalized workplace capability with System 800xA Operations
– System 800xA common functions such as history, asset optimization, SOE and TÜV certified engineers and safety execution centers
– Safety lifecycle services

Embedded diversity gives SIL3 without redundancy!

The embedded diversity in all of the previous features combine to allow System 800xA to provide SIL3 functionality without the need for redundancy.

SM811   PM865   TB840   Single I/O: AI8880, DI880 and DO880

800xA HI

Simplex: 1oo2D. Up to SIL3!

SIL3 without redundancy!

The System 800xA High Integrity configuration shown above is full SIL3 and neither the logic solver nor the I/O modules are redundant. The architecture is considered 1oo2D for SIL3 and is equal to the safety performance of 2oo3 configurations.

High performance results from the embedded diversity built into the PM865, the SM811, and each of the I/O modules. Add redundancy (as shown below) and you now have not only the best PFD, but also STR that exceeds TMR at 99.9999%!

Integrated safety
Key specifications

When specifying safety systems

In the past, it was sufficient to simply specify a Triple Modular Redundant (TMR) or 1oo2D redundant architecture. This is no longer the case. Choice of architecture / solution not only impacts safety, reliability and availability, it impacts engineering and hardware costs as well as footprint and installation cost.

The modern specification for a Programmable Electronic System (PES according to the standards) should include the following:

Standards and certifications

– SIL3-capable, certified according to IEC 61508 Ed 2, ISA 84, IEC 61511, Category 4, PL e according to EN 954, NFPA 72, NFPA 85, NFPA 86, EN54
– Hardware Safety Integrity measured by Probability of Failure on Demand (PFD) from 2.8E-05 to 8.5E-06
– Able to operate with the presence of multiple failures (Fault Tolerant) and take the plant to its safe state (Fail Safe action)
– Safe Failure Fraction (SFF) 90% - < 99%
– Certified to operate in G3 environment according to ISA 71

System specifications

– Systematic Safety Integrity or Systematic Capabilities including Code Difference Report and Audit Trail features
– Support for IEC 61131 Programming Languages, SIL3-capable and pre-certified
– Certified mechanism to perform On-Line changes, including but not limited to Application Program changes and firmware upgrades
– Modular I/O, including 1 msec SOE resolution for Discrete Inputs at the I/O module level
– Extensive use of Diverse Technology throughout system architecture
– Support for Alarms and Events

Integrated safety
Key specifications – Continued

Integration
– Safe and secure integration to DCS (800xA) without data mapping, including access control mechanism, preferable if such access control is a standard feature
– Ability to have safety and BPCS communications on the same cable and TÜV-certified for non-interference
– Safety values able to be trended on the DCS console without any external interfaces

Lifecycle
– Design implemented and documented by a product development organization following a functional safety management system and work processes certified according to IEC 61508
– System integration/project implementation should follow a functional safety management system compliant to IEC 61511. It is highly desirable that the system integration group is certified by an independent third-party agency such as TÜV

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Typical applications for certified safety systems

Many industries now have applications that require the certification, high availability or reliability normally found only in a certified safety system. These applications include:

– Emergency Shutdown Systems (ESD)
– Process Shutdown Systems (PSD)
– Interlock Systems
– Critical Control
– Boiler/Burner Management (BMS)
– Fire & Gas Protection/Detection (F&G)
– High Integrity Pressure Protection Systems (HIPPS)
– Pipeline Protection Systems (PPS)
– Remote Terminal Units (RTU)

Certified safety systems are used in all industries

As global process and machine safety standards mature and directives are issued mandating adherence to these standards, almost every industry has a need for certified safety systems, from small stand-alone 50 I/O controllers to large 1000-plus I/O integrated fully-redundant SIL3 systems.

Certified safety systems are now found in industries such as:

– Oil & Gas (upstream and downstream)
– Refining
– Pipelines
– Chemical / Petrochemicals
– Marine
– Metals
– Pulp & Paper
– Machinery
– Utility
– Fossil / Nuclear Fuels

Integrated safety
Testimonials

First integrated system and world's largest platform
Gullfaks A control and safety system

When the Gullfaks A platform went online in 1984 it featured the very first large scale integrated Process Control and Safety System, essentially constituting the starting point for ABB's 25+ years experience with integrated safety systems. Live (no shutdown) retrofit of Control and Fire&Gas systems through 3 generations of systems.

Troll A – largest platform on the planet

Troll A is the largest platform ever built. It produces about 75 million scm of natural gas and 10,000 bpd of NGL condensates per day. The original Infi90 based control and safety system for the platform was delivered in 1995. When the new integrated safety system went online on June 5, 2009 it was the first SIL3 certified 800xA High Integrity installation in the world. When the new integrated safety system went online on June 5, 2009 it was the first SIL3 certified 800xA High Integrity installation in the world.

Integrated BPCS and SIS
Atanor maintains competitive edge with System 800xA High Integrity

"For the A.O.A. II unit we wanted to integrate the basic process control system (BPCS) and the safety instrumented system (SIS) because we believed this would offer both financial and operational advantages."

"The system is flexible and adaptable to changes, enabling us to easily introduce improvements. What I like most is the comprehensive information it offers as well as the speed of operation."

Ormen Lange – Norway's first deepwater offshore development

The huge control and safety system includes over 15,000 I/O. Twelve redundant AC 800M HI controllers manage the process shutdown and fire & gas systems.When the new integrated safety system went online on June 5, 2009 it was the first SIL3 certified 800xA High Integrity installation in the world.

Enterprise asset management

An effective asset management strategy combines the needs of the production and maintenance organizations. It increases both equipment availability and production rate by providing insight into asset health, corrective action instructions and organizational visibility. It reduces time-to-decision and coordinates production and maintenance activities. The result is higher asset availability and significantly reduced maintenance costs.

Enterprise asset management
Executive summary

Increased plant availability with less maintenance

Today's industries have a strong pressure to maintain a high level of productivity. Meeting this demand requires a clear asset management and maintenance strategy that increases asset availability and performance, while maximizing operations and maintenance effectiveness. Maintenance is the largest controllable cost in a process manufacturing facility. Knowing the status of critical assets tells you what needs maintenance and, just as important, what doesn't. This is the key for reducing maintenance costs.

The challenge is to achieve plant-wide real-time condition monitoring of all types of critical assets. Relevant information has to be available at the right time, in the right form and to the right people. To promote collaboration between operations and maintenance, and streamline the overall work processes, plant owners must connect and share maintenance data between the DCS system and a Computerized Maintenance Management System (CMMS).

The solution

ABB has a unified approach to asset management with a wide range of products, solutions and services. We offer all-encompassing asset monitoring capabilities with System 800xA Asset Optimization (AO). AO brings together, in one user interface, all information resident in different, traditionally disparate, automation and monitoring systems to provide a composite view of the health and performance of an asset. AO eliminates the need for users to switch between several systems, workplaces, application environments and navigation schemes. CMMS integration allows you to keep track of your assets from the plant floor and throughout the enterprise.

Enterprise asset management
Definition

Asset management is more than a product feature or way to manage devices and tasks. It is a strategy that provides the capability to optimize all aspects of the operational asset in order to extend the asset's life, reduce its lifecycle costs and ensure its availability. Realizing a complete asset management strategy requires two types of systems; plant asset management and enterprise asset management.

Plant asset management
PAM (plant asset management) systems provide a single application for predictive diagnostics, documentation, calibration management, and device configuration for managing different types of assets. Fieldbus technology plays an important role in PAM systems by providing access to diagnostic data from field devices and electrical equipment. Traditional hardwired connections limit the amount of diagnostic data that can be used for maintenance analysis.

Equally important is to be able to analyze process-related data, e.g. data from heat exchangers and PID control loops. Plant asset management systems are also used for machinery and vibration monitoring.

When the diagnostic and process data is collected, maintenance users can monitor asset health and make the right decisions based on real-time data, either from maintenance work places or different types of mobile applications and notification systems.

Enterprise asset management
Definition – Continued

Enterprise asset management

It is crucial for capital-intensive industries to maximize the return on investment from their asset base. The objective is to obtain maximum productivity from the asset and minimize the total costs involved in its acquisition, operations as well as maintenance.

By managing assets across the facility, organizations can improve performance, reduce capital costs, reduce asset-related operating costs, extend asset life and consequently improve return on assets.

Enterprise asset management provides the framework for resource and labor allocation decision processes across the competing categories of equipment addition/ reduction, replacement and maintenance budgets in order to meet business needs.

Computerized maintenance management system (CMMS) maintains information about the plant assets and the maintenance organization's operations. This information helps maintenance workers plan and execute their jobs more effectively, and aids management in making informed decisions.

Promoting collaboration between daily operations and maintenance requires streamlining the overall work processes related to maintenance. This means connecting and sharing maintenance data between the Plant Asset Management system and the Enterprise asset management system.

Maintenance strategies

Several different strategies are used for plant maintenance, spanning corrective maintenance (fix on failure) to predictive maintenance (maintenance when condition is detected). In addition, continuous improvement initiatives such as Reliability Centered Maintenance (RCM) strategies can play important roles. According to studies done by ARC advisory group, corrective maintenance can cost up to 10-times as much as predictive maintenance. It is therefore crucial to have a maintenance strategy with both preventive and predictive components to improve asset reliability and reduce maintenance costs.

Enterprise asset management
Value proposition

Who should care most about asset management?
Industries with costly equipment and high requirements on availability.

Increased plant availability
Production facilities employing real-time asset management systems significantly increase process uptime. Real-time condition monitoring of critical assets detects early warnings of malfunction so that corrective action can be planned in accordance with current production status. This ensures high overall equipment effectiveness. In addition, proactive maintenance practices reduce unscheduled shutdowns while keeping product quality high.

Reduced maintenance costs and increased overall equipment effectiveness
Maintenance is the largest controllable cost in a process manufacturing facility. One reason is that corrective and preventive maintenance strategies still dominate. One survey from a process industry shows that as much as 80% of maintenance activities result in no activity. Knowing the status of all critical assets tells you what to maintain and, equally important, what not to maintain. Real-time condition monitoring, together with predictive and proactive maintenance strategies, creates the foundation for reducing maintenance costs.

Improved collaboration between operations and maintenance
An effective asset management strategy combines the needs of both the production and maintenance organization. With a seamless connection between PAM/EAM systems and related working procedures, asset information is provided in the proper context to operations, maintenance, engineering and management. With this approach, time-to-repair is reduced and coordination between production and maintenance activities is made more effective. All these improvements contribute to better collaboration between plant production and maintenance departments.

Enterprise asset management
System 800xA Extended Automation
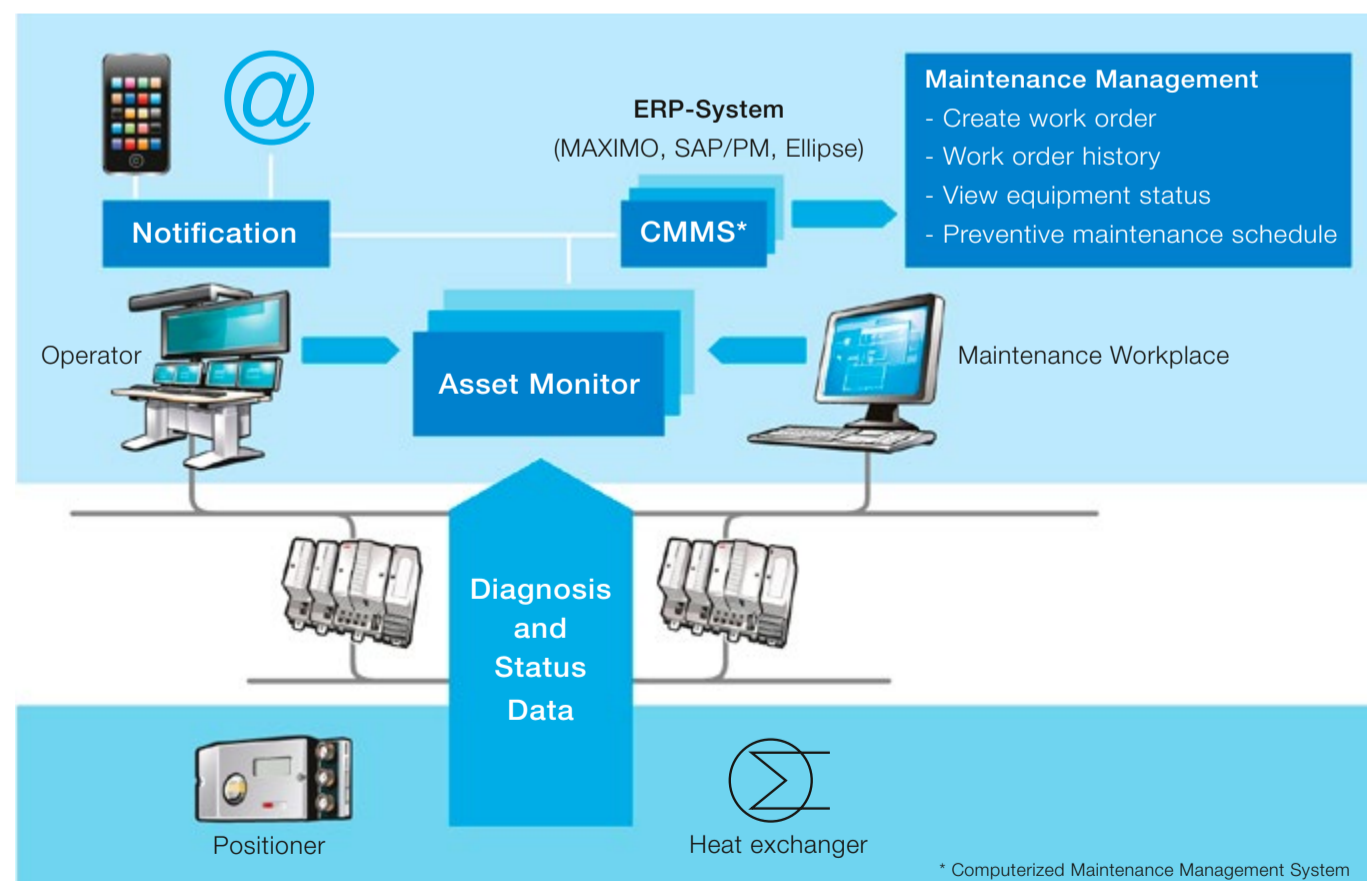# The power of integration

The power of integration – asset management

Automatic condition monitoring of key assets is the starting point for apply-ing condition-based maintenance and predictive maintenance strategies. Maintenance activities can then be focused on the assets that actually require maintenance.

System 800xA provides an extensive range of asset condition monitoring for:
– Electrical systems
– Process instrumentation and valves
– Rotating equipment and vibration
– IT equipment
– Process equipment

System 800xA empowers maintenance users of a system with a tailored Maintenance Workplace. Maintenance Workplace offers one single user-in-terface for all types of maintenance actions. When an asset alarm occurs, the user is guided by the system and shown the possible cause plus a sug-gested action to correct the situation.

Notification

ERP-System
(MAXIMO, SAP/PM, Ellipse)

Maintenance Management
- Create work order
- Work order history
- View equipment status
- Preventive maintenance schedule

CMMS*

Operator

Maintenance Workplace

Asset Monitor

Diagnosis and Status Data

Positioner

Heat exchanger

* Computerized Maintenance Management System

Enterprise asset management
System 800xA Extended Automation
The power of integration

System 800xA also bridges the gap between daily operations and the maintenance organization within the plant. With 800xA CMMS integration, all maintenance data is easily accessed from the control room. Production can be planned according to current maintenance activities and operators assume a proactive role in plant maintenance by adding new maintenance workorders as problems occur during production.

Enterprise asset management
Key specifications

Specifying asset management systems

To achieve effective maintenance strategies throughout the entire plant, many types of assets require real-time condition monitoring. This includes not only process instrumentation but also electrical equipment, process and machinery equipment and the control system itself, including the IT infrastructure. A plant asset management system specification should include the following:

Standards and certifications

Field device integration based on open standards like Profibus, Profinet, HART, Foundation Fieldbus, IEC 61850, etc. Asset diagnostics reporting should be according to NAMUR NE107.

System specifications

Real-time condition monitoring for a wide range of assets, including descriptions of possible causes and suggested corrective actions for each condition. One single user-interface where maintenance users can access all types of asset-related information and systems. CMMS Integration to enable seamless access to workorders, workorder history, etc. from all DCS workplaces.

Integration

The system integration group implementing asset management requires a deep understanding of condition monitoring for different types of equipment. The ability to offer a wide portfolio of services such loop tuning, system status checks, remote diagnostics, etc. is also highly desirable.

Enterprise asset management
Typical applications

Process instrumentation and valves
Process instrumentation and control valves are critical assets that require different levels of condition monitoring. The use of fieldbus protocols enables both device configuration and real-time condition monitoring of field instrumentation and valve positioners from System 800xA workplaces.

Electrical systems
Reliable electrical systems for power generation and power distribution are essential for plant uptime. System 800xA allows not only control and supervision, but also condition monitoring of low, high and medium-voltage electrical systems. This gives maintenance personnel a complete picture of the electrical systems in the plant and also enables a range of cost-saving energy-efficiency programs.

Vibration monitoring
Mechanical equipment such as large rotating machines often comprise key assets in industrial plants. Failure of such key assets is costly and can cause long downtimes in production. System 800xA provides several levels of mechanical condition monitoring from basic vibration monitoring to complete mechanical asset analysis with detailed root cause analysis tools.

PID loop performance
Good performance of PID control is required to maintain the defined process state and reduce equipment wear. System 800xA performs automatic loop monitoring and detects both malfunctioning PID loops and control valves. Automatic loop monitoring improves control performance, but also lowers costs by reducing the consumption of instrumentation air, reducing control valve wear, etc.

Heat exchanger performance
Overall energy efficiency in industrial plants is to a large extent dependent on the performance of heat exchangers. System 800xA heat exchanger asset monitor monitors deviation from defined operating points. The result is improved process performance plus lower maintenance costs for heat exchangers.

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IT equipment monitoring
Modern control systems, and their required integration with related types of systems, rely on the availability of IT infrastructure like servers, clients, networks and network components. System 800xA provides full IT infrastructure monitoring to ensure the reliability of the IT asset in a system installation.

Integration to CMMS
To streamline maintenance procedures and promote collaboration between daily operations and maintenance departments, maintenance data must be shared between the plant asset management system and the enterprise asset management system. With System 800xA, CMMS integration maintenance data such as active workorders and workorder history can be shared seamlessly between 800xA workplaces and the CMMS.

Enterprise asset management
Testimonial

Product quality – early-warning paging system

Bayer Healthcare in Berkeley, CA, had a legacy Microsoft Access PC-based early-warning paging system. It was developed internally by Bayer but became unreliable and unsupportable when the original system developers left the company. Bayer turned to ABB to create an integrated asset management system that was easy to use and support. ABB implemented an early-warning system by using 800xA's Asset Optimization. The solution monitors certain process information to detect quality issues early and then notifies the right personnel to rectify the situation.

If the process goes astray, asset monitors trip, alarm and events are generated, and pagers are activated. The on-call Bayer engineer is alerted by pager. If off-site, the engineer then remotely logs into the system and works with the on-site operators to analyze and correct any potential issue before it becomes a problem. If the on-call engineer does not respond to the page within a certain period of time, a backup engineer is automatically alerted by 800xA AO. All pager events and activities are tracked and logged in System 800xA.

Results include greater reliability, lower system maintenance costs, and improved ability to respond to process upsets. IT asset monitoring was implemented next, along with remote access and third-party monitoring. Remote access is made easy by the built-in System 800xA AO web server being combined with a secure remote access solution from ABB Services. Now not only will the appropriate ABB engineer be able to remotely access the site systems, select Bayer employees will also enjoy remote access to the Berkeley site systems.

Future plans include adding a consolidation AO server at site level. This will consolidate asset information among buildings. Only information outside of the building's area is reported, which puts less strain on the building's control system. The site consolidation server will provide a single point of entry for administration.

Fieldbus technologies

Fieldbuses have been around for more than two decades now. One key driver is the digital age; more and faster information. A second, and perhaps more important driving force, has been cost reduction from the point-to-point 4-20 mA (or any other 'amp' or 'voltage' range) solutions that have existed since the beginnings of process instrumentation and automation.

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Moving on from the 4-20 mA!

Fieldbuses have been around for more than two decades now. One key driver is the digital age; more and faster information. A second, and perhaps more important driving force, has been cost reduction from the point-to-point 4-20 mA (or any other 'amp' or 'voltage' range) solutions that have existed since the beginnings of process instrumentation and automation. Although 4-20 mA may still continue for many years to come, fieldbuses are the current and future architecture for process automation.

Fieldbuses: many types and purposes

Fieldbuses are available in many types and serve many different purposes and applications. Many of the 'older' models like MODBUS and DeviceNet are now expanding from their RS232/RS485 origins onto ethernet media. The digital information that HART has provided for years is now becoming available with a networked infrastructure thanks to WirelessHART.

Simple, low-power devices can now be easily installed in hazardous areas with an AS-i bus. And high-demand, complex requirements can be fulfilled with selections from FOUNDATION Fieldbus, PROFIBUS and IEC 61850. In addition to international standards, ABB has addressed special needs throughout its history with proprietary fieldbus solutions for INSUM electrical and Drive integration, as well as remote I/O solutions from previous generations of products. The latter greatly simplify the evolution of previous platforms to today's AC 800M controllers and all the features available with System 800xA.

System 800xA Extended Automation – The power of integration

System 800xA is designed to be the best system for integrating fieldbus solutions to meet the demanding requirements of system owners. Each AC 800M controller can mix and match incoming information from any combination of up to 12 direct fieldbuses. Via the use of gateways on the native PROFIBUS infrastructure, more can be used if required. Supporting fieldbuses deliver significant value to end-users as both CAPEX savings (wiring, footprint, weight) and OPEX savings (asset management, heating and cooling, design flexibility, maintenance strategy).

Fieldbus technologies
Background

The move towards less and less wiring

Fieldbuses have nearly always developed around a common theme of reduced wiring. However, the use of digital designs for field devices increased the benefits beyond wiring to enable maintenance practices and value-added asset management. This reduced costs previously attributed to unexpected failures and the resulting loss of plant production, product quality, or even severe equipment damage in extreme cases. Newer fieldbus designs now allow direct communication and control between field devices, creating flexibility and design options that can further reduce both CAPEX and OPEX.

But the heart of all fieldbuses is still focused on reducing wiring. Originally a single device communicated via a single pair of wires. But slightly more complex devices, e.g. weighing scales, communicated not only weight, but also needed commands and statuses like reset, tare, and zero; each originally done on separate wires. Nevertheless, early fieldbus protocols, e.g. MODBUS, allowed a single pair of wires to do the job of many. This created significant cost savings.

Improvements continued, moving from one pair of wires per device to 'networking' several devices. This further reduced wiring requirements. But only half of the original wiring was addressed. Each device still needed to have power!

The development of the Manchester Bus Protocol allowed for analog and digital signals to be carried on the same pair of wires used to power the device. This single development contributed to the protocols we know today as HART, PROFIBUS PA and FOUNDATION Fieldbus H1.

The introduction of ethernet infrastructures further reduced wiring costs. The first impact was consolidating communication from many device networks onto a single network, as in the FOUNDATION Fieldbus HSE design. High-speed fiber networks also allow consolidating many individual network protocols (MODBUSTCP, Ethernet/IP, PROFINET, FOUNDATION Fieldbus HSE, IEC 61850) onto a single glass-fiber pair.

At present, the ultimate reduction in wiring is wireless. This has many forms and will undoubtedly have a considerable impact on the future.

Fieldbus technologies
Definition

Fieldbus – a general terminology:
– Fieldbus is a general term applied to digital automation communication networks, not a specific technology like FOUNDATION Fieldbus.
– Fieldbuses come in three communication rate formats … serial (31.25 Kbits/sec), vendor-selected (>31.25 Kbits/sec to <100 Mbits/sec), and ethernet (10/100 Mbits/sec and greater).
– Fieldbuses generally provide a networking architecture to eliminate point-to-point wiring for digital instrumentation
– Fieldbuses also provide high-speed communication networks for large-volume data providers (drives, PLCs, MCCs, etc.)

Fieldbuses come in many forms:
– MODBUS, MODBUS TCP
– PROFIBUS DP/PA, PROFINET
– FOUNDATION Fieldbus… FF HSE, FF H1
– DeviceNet / Ethernet/IP
– IEC 61850 Electrical Integration Bus…
– HART is not a true fieldbus, but is often included in this group
– AS-i bus… simple, low-power, usually discrete
– Interbus… peer communication
– WorldFIP… one of the original eight 'fieldbuses'
– ControlNet… unique co-axial physical layer
– CAN Bus… mostly automotive applications
– SwiftNet… Specific to Boeing aircraft
– P-Net… one of the original eight 'fieldbuses'
– More will come as IEC 61158 is expanded!
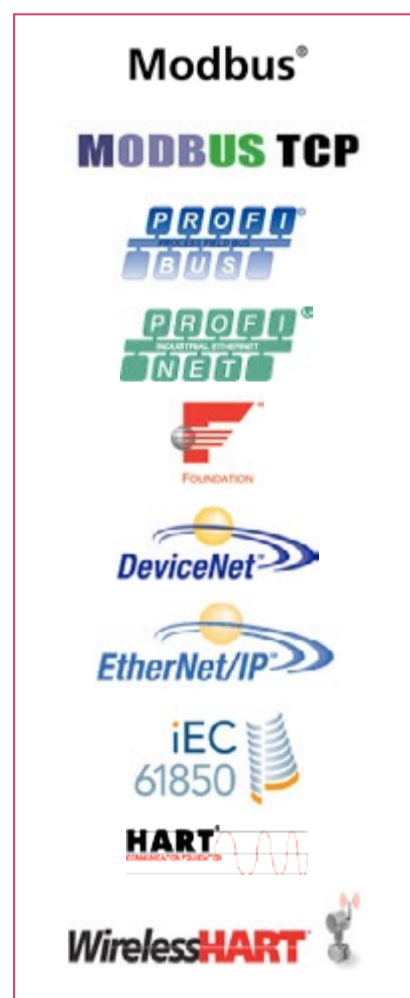
Which fieldbus is best?
The right answer is "it depends on the application and what's already installed". An optimized solution will probably use more than one fieldbus type. For example, new 'analog' installations benefit greatly from FOUNDATION Fieldbus, while new 'discrete' installations can benefit from PROFIBUS, PROFINET, DeviceNet, and Ethernet/IP. Electrical Integration depends on the equipment supported protocol, but IEC 61850, Ethernet/IP and PROFIBUS could all prove useful. The most common view is to look at the current installed base, whether HART, PROFIBUS, DeviceNet, MODBUS, or others. Why replace when you can integrate?

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Value proposition

Who should care most about this technology?
– Control System Designers
– Electrical System Maintainers
– Plant Engineering
– Plant Maintenance
– Plant Management

> Typically, the engineering groups responsible for DCS design and electrical maintenance will drive this technology.

What's the value with Fieldbus technologies?
Capital expenditures:
Many installations of fieldbuses are similar in CAPEX cost to conventional installations using remote I/Os. Savings are realized in reduced installation and commissioning costs. In addition, multi-function devices, e.g. pressure-temperature-flow, can reduce the number of devices required from three to one, and require only a single process penetration (instead of three). This generates big savings! Termination example:

Type	Conventional	Fieldbus	Savings
	Terminations		
Valve 1	45	17	62%
Valves 2-4	135 (45 ea.)	15 (5 ea.)	89%
Xmtr 1	15	5	67%
Xmtr 2-12	165 (15 ea.)	55 (5 ea.)	67%
Total	360	92	74%
1000 Devices	22500	5750	At $30/hr
Hours (@ 1 min.)	375	96	$8,370

279 hours = 1.7 man-months time savings!

In today's competitive marketplace, actual time-savings are more important than saving on labor costs. Time saved can mean faster project completion, where getting product to market weeks or even days faster can mean huge benefits. Another contributor to time savings is shorter commissioning, which can lead to similar results.

Operational expenditures:
Although project savings may or may not be realized, plant operators who apply fieldbuses for device management and maintenance benefit greatly. Even standard HART, with devices communicating at 1200 baud, creates opportunities to implement maintenance strategies that optimize asset performance and utilization, eliminate unnecessary maintenance, avoid unplanned interruptions to plant operations, or extend plant turnaround cycles. For example, programs focused on reducing a reactor unit's maintenance costs and increasing asset utilization by 15% or more can result in substantial savings.

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The power of integration

What value does System 800xA provide?

System 800xA offers the most useful set of fieldbus communication options in the industry. Other vendors may offer different choices, but the fieldbuses supported by System 800xA today are those in demand. This provides optional single-gateway connectivity to nearly every other automation communication protocol currently in use.

Unmatched control and monitoring integration

The ability to connect up to 12 different fieldbus communication options (both standard and ABB product-specific) to a single controller creates control and monitoring integration that is unmatched in industry today.
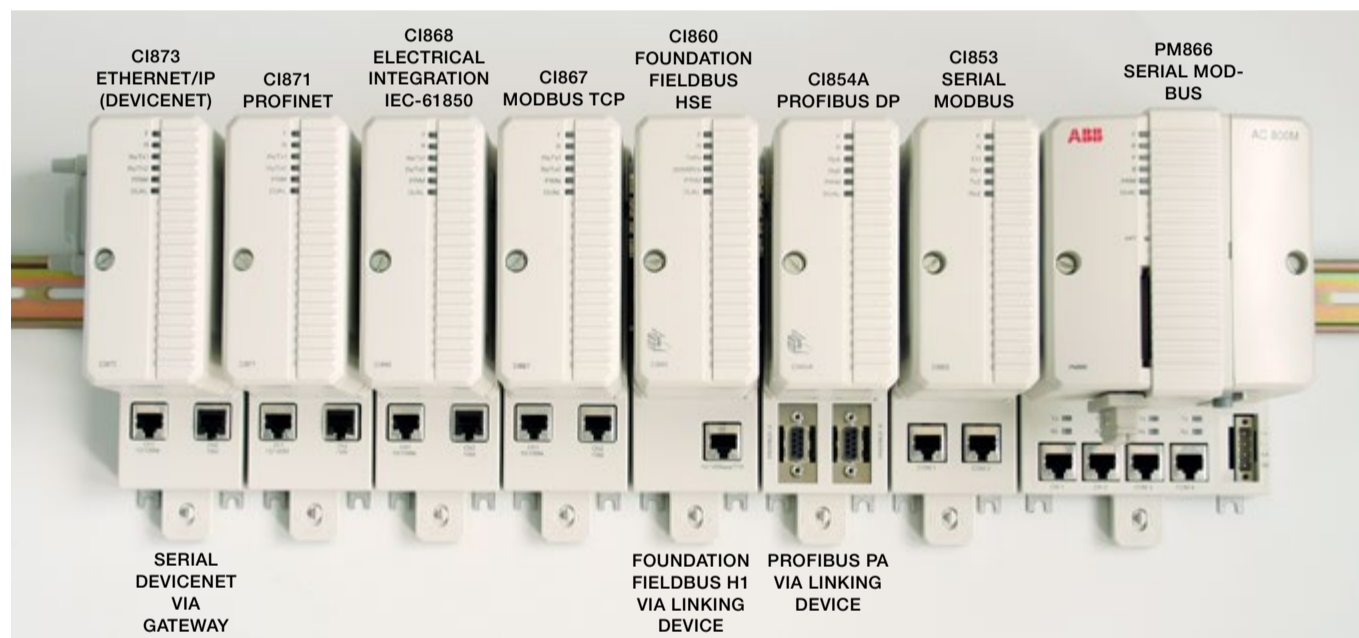
Standards-based Fieldbus communications for System 800xA AC 800M controllers.

Optimized control solutions through integration

The powerful integration of so many fieldbus options generally provides all the information needed for an overall optimized control application directly to that application. For ethernet-based communications like FF HSE, Ethernet/IP, MODBUS/TCP, PROFINET and IEC 61850 especially, the wide-reaching network infrastructure allowed by these protocols allows individual controllers to see information from nearly anywhere on the entire network. The need for individual controller-dedicated I/O structures typical for decades of controller communications is thus eliminated.

Not everyone can perform simultaneous control and monitoring of everything from electrical switchgear and synchronized variable frequency drives to third party PLCs, intelligent digital instrumentation and standard instrumentation connected to long-installed, previous-generation I/O subsystems within a single controller and within a single control application. But ABB AC 800M controller can!

Fieldbus technologies
Typical applications

How might different System 800xA fieldbuses be applied?

MODBUS (CI853)
MODBUS (serial) has been used for more than 15 years to connect devices and remote I/Os to PLC and DCS controllers. It is used for simple peer-to-peer applications between different brands of controllers. Point-to-point applications use RS232 and RS422 communications while networked structures for up to 32 devices use RS485. MODBUS connectivity can be done directly to an AC 800M controller on port 3 or with a CI853 module (two connections).

MODBUS TCP (CI867)
MODBUS TCP now brings the MODBUS communication protocol into the ethernet environment, improving data communication rates from the serial basis of 31.25 Kbits/sec to normal ethernet speeds of 10/100 Mbits/sec or faster. MODBUS TCP will greatly enhance peer-to-peer communication applications where MODBUS is a common protocol.

DeviceNet (gateway with CI873) new in 5.1
DeviceNet has grown from its European origins in Bosch on CAN bus for automotive applications to be a dominant communication standard throughout the discrete manufacturing domain. It has applications in every-thing from simple limit and proximity switches and push buttons to valve manifolds and more complex AC and DC drive applications.

EtherNet/IP (CI873) New in 5.1
EtherNet/IP is the TCP/IP ethernet extension of DeviceNet (and Con-trol-Net). In addition to the speed increases achievable with ethernet, the protocol also includes standard object and device models that simplify communication message structures. A primary application of EtherNet/IP within System 800xA will be to provide high-speed connections to PLCs and Motor Control Centers (MCCs) that use this protocol.

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PROFIBUS (CI854A)

A core component of System 800xA control for many years, PROFIBUS DP and PA are used for many applications, including remote I/O with S800 and S900 products, connectivity to PB/PA devices like transmitters and valves, and solutions with AC and DC drives. PROFIBUS can also serve as a key communications link to other automation protocols with many third-party gateways, thus helping meet almost any connectivity need. One great example uses the distance-covering features of fiber optic or wireless PRO-FIBUS DP to reach distant corners of a facility where the extremely short distance AS-i Bus network may be required. Controller local AS-i Bus inter-faces cannot address this solution without installing the controller remotely.

PROFINET (CI871) new in 5.1

Like many of the other protocols looking for higher throughput capability, PROFINET now provides many of the features of PROFIBUS DP on an eth-ernet backbone using the tools and seamless connectivity features already familiar to PB/DP and PB/PA users. PROFINET is one of the key network-ing infrastructure protocols. Users will have to integrate a wide range of automation networked solutions, including connectivity to other automation protocols via gateways. ABB System 800xA is the only DCS to provide PROFINET and FF HSE as enabling infrastructure networks.

HART (AI815, AI845, AI880, AI895, AO815, AO845, AO895)

Frequently included in the topic of fieldbuses is the HART protocol. This is not a true fieldbus, but rather a protocol that transmits digital data over the analog current (4-20 mA) wiring using Manchester Bus Protocol methods.

This is the reason why the interface into System 800xA is a collection of I/O modules instead of a fieldbus communication interface module. The process value (PV) of the transmitters is provided by the 4-20 mA current signal. Communication of the HART data, the PV and up to three additional analog values along with a vendor-determined number of diagnostic values, is transmitted at 1200 bits/sec (baud). This rate is far too slow for normal control but is quite useful for device diagnostic information and asset man-agement applications.

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WirelessHART (Pepperl+Fuchs wireless gateway)

The new HART 7 standard expands HART application into the wireless environment, making HART more "fieldbus" like. Both wire powered and true wireless (battery powered) devices are available. Also, available are transmitters that can be put on traditional HART devices which ABB calls "Field Key" adapters. Note that although the wireless functions will operate at 250 Kbits/ sec, a non-HART 7 device will still only provide its data at 1200 baud. All of these HART wireless device's signals can be accepted by the P/F gateway and then communicated to 800xA Device Management, Asset Optimization, AC800M Controllers, or directly to the HMI. While new wireless HART 7 devices may be applied to monitoring functions with data update rates around 10 seconds vs. minutes, adoption of these signals for control will be limited.

FOUNDATION Fieldbus HSE (CI860) and H1 (LD 800HSE)

FF HSE is the second key infrastructure protocol among current field-buses. It has the potential to provide a universal basis for remote I/O and gateway-based interfaces to many commonly used automation protocols. FF H1, the device-level network for FOUNDATION Fieldbus, is a perfect example of this functionality, where the LD 800HSE Linking Device is the gateway. FF offers the unique capability to fully distribute control into field devices using function blocks similar to those used in most DCSs today. This creates a highly reliable control solution. ABB System 800xA is the only DCS that offers full implementation of FF HSE and FF H1. It provides a variety of key user benefits unmatched by a direct FF H1 only solution.

Fieldbus technologies
Typical applications – Continued

FOUNDATION Fieldbus High Speed Ethernet (FF HSE) is unique to ABB's System 800xA. Compared to other DCS vendors, this offers ABB clients unique advantages when applying FOUNDATION Fieldbus (Rockwell PLCs use HSE technology):

– No controller required! All FF data is available at the user interface without using controller resources (more control, less hardware).
– Using FF as it is designed to apply control functionality in field devices increases the availability of the system by eliminating reliance on controller hardware and the risk of controller failures that this implies.
– Further wiring reductions. Linking Devices may be distributed to general purpose areas closer to the actual field devices to reduce FF H1 segment wiring to a minimum compared to long home runs to a central area where controllers are located.
– Possibilities of a wireless future. Although not applied in production facilities to date, the FF HSE infrastructure could be built entirely on wireless ethernet networking. This would completely eliminate wiring between a central control area and the field FF H1 distribution points!
– Eliminate peer-to-peer data sharing. Up to 15 controllers on a single FF subnet may use any of the data from any device on that subnet (more control, less engineering).
– ABB LD 800HSE linking devices have now been certified to support republishing of data from one H1 segment to another on the same or different linking devices. This feature further reduces the need to have FF data managed by a controller to send data values to FF applications other than the one in which the data originates.

Electrical integration IEC 61850 (CI868)
Introduced in System 800xA as part of SV5.0 SP2, electrical integration (EI) is a key addition to AC 800M communications. It will enable users to finally optimize in real time how they use their electrical subsystems within a facility relative to the power utilization required by process manufacturing needs.

WirelessHART

Many plant operators have installed HART devices but have left the diagnostic data 'stranded' for decades. This can now be remedied. Opportunities also exist for operators to reach a higher level of automation by using wireless technology to measure that which was previously un-measurable due to the cost of accessing certain locations.

WirelessHART
System 800xA Extended Automation
The power of integration

Wireless technologies open up new opportunities
Many ABB clients have lots of installed 4-20 mA HART devices, but with no remote access, diagnostic data has been left 'stranded' for decades. Opportunities to reach higher levels of automation have also been missed due to the costs involved in accessing certain locations. Wireless technologies will help resolve these missed opportunities.

The solution is 'everywhere' around you
Two wireless technologies are prevailing: WirelessHART and ISA's SP-100. WirelessHART was available first, but ISA SP-100 was not far behind. Neither standards will be interoperable so most vendors will have to support both to meet end-user expectations.

WirelessHART is here!
WirelessHART is the first available standard with devices becoming available from major vendors. Many wireless devices rely on battery power and optimize data refresh rates longer battery life. As a result, wireless process monitoring is often suited to slow loops where update rates longer than 30 seconds are acceptable. Another power option is energy harvesting, where power is taken from the environment or an external source (e.g. loop power). Devices that use energy harvesting have no battery, so may have more frequent data refresh rates. ABB provides a simple first step towards wireless by offering the FieldKey Wireless adapter. This device can be connected to any 4-20 mA HART instrument, adding wireless capability to read process data and device maintenance conditions. FieldKey draws power from the 4-20 mA loop, so there is no battery to manage or discard. It's also simple to use and can be installed within 3 minutes.

System 800xA Extended Automation – The power of integration
System 800xA already has an outstanding, integrated solution for Pepperl+Fuchs (P+F) multiplexers and therefore easily obtained an integrated WirelessHART solution using the P+F WirelessHART. The difference is that users can optionally get data from a WirelessHART network into a controller with MODBUS TCP capability (e.g. the AC 800M) to use in controller logic, as well as into 800xA's Asset Optimization to give a form-fit solution. This, along with ABB Measurement Products, WirelessHART FieldKey adapters, and Consult IT Wireless Services offerings, gives ABB a complete package.
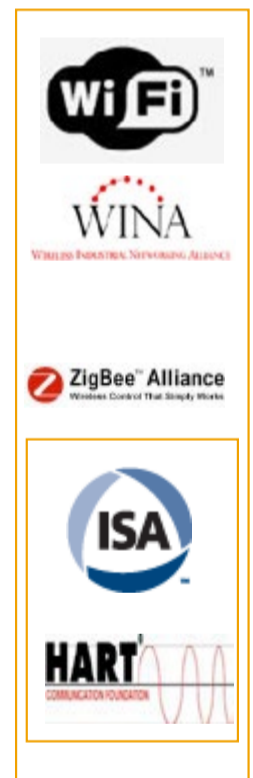
WirelessHART
Definition

There's got to be a better way

– Existing brown-field sites may have a lot of HART instruments installed, but due to older control system technology and the complexity of multiplexer networks, end-users haven't taken advantage of the data that's currently in their plant's instrumentation. There are 30 million HART devices are installed worldwide, yet 85% of them are not being used as smart devices (i.e. using their diagnostic information for condition-based monitoring / asset optimization).

– In addition, green-field project costs are always under scrutiny, and ways to reduce costs while retaining or increasing functionality are therefore very popular. Some signals are hard to connect into an automation environment due to physical constraints. Engineering and construction costs for trenches, cable trays, conduits, junction boxes all add up, making it hard to justify bringing in certain I/O due to the location. The monitoring of process variables may thus still be inadequate for creating a reliable automation solution.

The solution is 'everywhere' around you

Wireless is a technology that has already been used in various ways in process automation, e.g. remote workforce, vibration monitoring, diagnostic retrieval, etc. It thus makes sense to use this technology to solve the problems mentioned above, and the marketplace has driven standards organizations to come up with usable, reliable, resilient, secure and robust solutions.

The two primary standards for wireless instrumentation that can meet industrial marketplace requirements are WirelessHART and ISA SP-100. Both will most likely be present in the future and have similar goals, but WirelessHART is currently further ahead due to timing and a large installed base of HART smart instrumentation. Instruments and adapters for existing non-wireless instruments are being developed against the standard and certification testing will follow shortly. There are plans for both standards to co-exist in the same wireless infrastructure, but they will most likely not be interoperable. Most companies will adopt both standards to meet user expectations.

Various wireless standards organizations

WirelessHART
Definition – Continued

A WirelessHART network consists of WirelessHART field devices and at least one WirelessHART gateway. These components are connected into a wireless mesh network of field devices, or instruments, supporting bi-directional communication. WirelessHART technology is backward compatible with currently installed HART devices and is a complementary enhancement to the HART Protocol. Two common use cases are for 'wired' and 'wireless'.

Wired

Wired refers to where HART devices are installed and the process variable (PV) is read at the control system via the 4-20 mA loop. Although used during commissioning, the HART data is not connected to the control system in real-time, which limits the value of the asset investment. Wired transmitters can be retrofitted with a 'WirelessHART adapter', making it possible for the device to transmit HART data to a WirelessHART gateway and then on to asset management software.
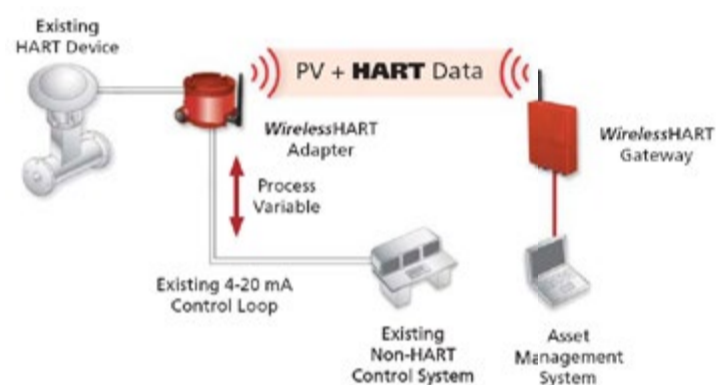
Wireless

A WirelessHART device is a freestanding device that eliminates the analog connection to the control system. The device can be installed anywhere in the plant without the cost of wires and is typically battery powered. PV and HART data are connected to a control and/or asset management system via a WirelessHART Gateway.
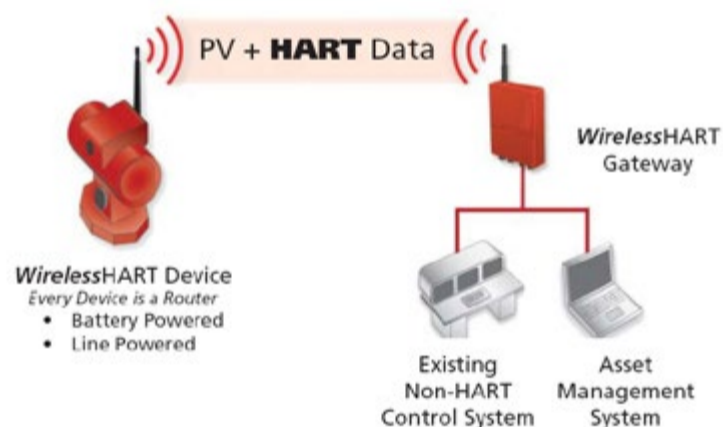
HART 7 is the latest standard, allowing for communication rates of 250k BAUD, which translate into update rates in 'seconds'. HART 5 /6 standard is limited to more of a serial, polling communication rate of 1.2k BAUD, which is in the 'minutes' realm. "What rev are your HART devices?"

WirelessHART
Value proposition

Who should care most about WirelessHART?
– Control system maintainers
– System administrators,
– Maintenance managers
– Engineering
– Instrumentation and control
– Plant management

> Typically, the engineering and maintenance groups responsible for projects and reliability maintenance will drive this technology.

What's the value to end-users?
WirelessHART: simple, reliable, secure. Simple meaning that it's easy to install, commission and maintain. Reliable meaning that it's self-healing using a mesh or network architecture. Secure (most importantly) by using a multi-layered protection approach.

Capital expenditures
Reduced engineering and installation costs: Reduction of labor, wiring and materials can be realized due to wireless access to diagnostic and process variables without having to dig trenches, run cables/cable trays, conduits, junction boxes, etc. Example: A raw material/storage tank(s) should be measured but due to its location across a road is considered too expensive due to the engineering design hours, construction labor, equipment rentals, wireways, wires, instruments, etc. required. A manual retrieval process was instead put in place but this ran into problems with data accuracy, labor issues, scheduling, mistakes, etc. that resulted in regulatory fines. With WirelessHART, a secure, reliable wireless solution is now available. This negates the installation costs, and adds the benefit of not only getting the measured values, but also the added capability to remotely configure, manage, and monitor the HART instruments/transmitters.

Operational expenditures
Improved operations/reduced maintenance costs: Providing wireless access to stranded device information can improve the asset's utilization, thereby increasing the integrity of the overall solution. Example: Un-stranding valuable diagnostic data for condition-based monitoring can reduce overall maintenance costs. Retrieving diagnostic data that indicates valve position feedback, low air pressure to a valve actuator, or excessive valve stroke length, can lead to significant productivity savings by preventing downtime, improving maintenance planning and overall asset utilization.

WirelessHART
System 800xA Extended Automation
The power of integration

What value does System 800xA provide?

System 800xA enables plant operators to utilize modern technologies such as WirelessHART, which provides a means to more easily capture and exploit diagnostic data within existing HART field devices, as well as to access wireless process variables for use in a real-time monitoring and non-critical control environments.

– System 800xA provides seamless access for operations and maintenance to WirelessHART data. WirelessHART is integrated to System 800xA's Device Management infrastructure through its existing HART Multiplexer integration, providing seamless operations and maintenance interaction. You interact with WirelessHART data as you would with any HART data coming into System 800xA.

– System 800xA's pre-integrated Asset Optimization reduces time and capital expenditure. Since Asset Optimization is built into System 800xA, it's easy to make use of the newly liberated data for asset utilization improvement endeavors such as reliability-centered maintenance programs.

– System 800xA's AC 800M Controller platform provides a seamless configuration environment. Using System 800xA's full featured AC 800M controller with over 10 communication interfaces, control and monitoring applications are unhindered thanks to connectivity to process data from various sources, including WirelessHART via MODBUS TCP. In addition, MODBUS TCP capabilities allow up to 4 CI cards on different controllers to access the WirelessHART process variables simultaneously.

Evolution opportunities

The 'wired' solution is the best opportunity as many ABB clients have installed HART transmitters yet do not access the data for continuous monitoring applications!!
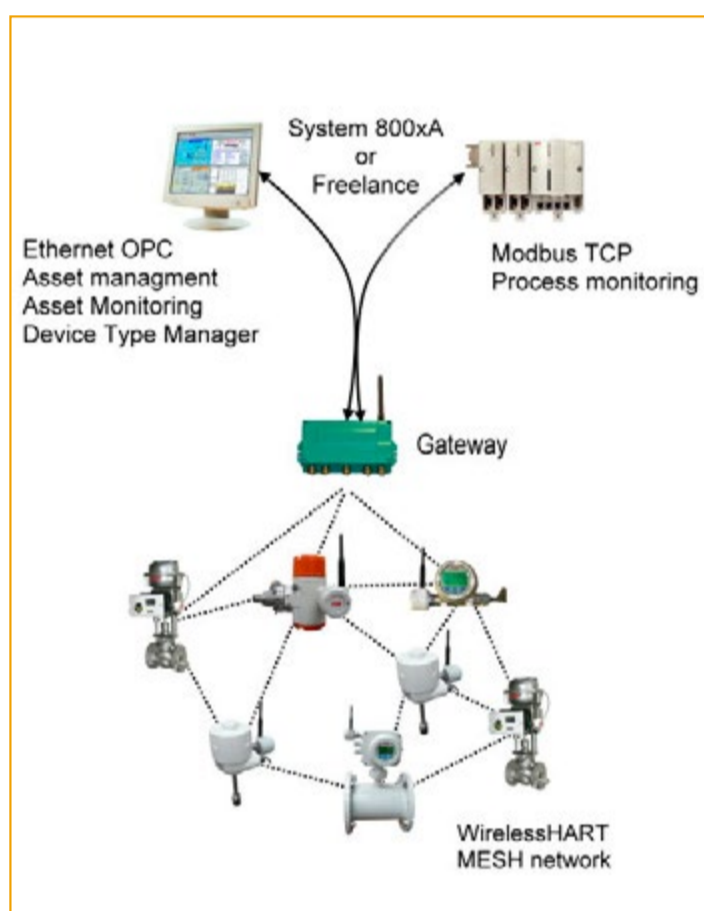
WirelessHART
System 800xA Extended Automation
The power of integration – Continued

The solution

ABB has chosen P+F's wireless gateway as its WirelessHART solution for tight integration with System 800xA. P+F WirelessHART Gateway connects to WirelessHART devices via a MESH network. The P+F WirelessHART Gateway can then connect to 800xA in basically two ways depending on the application: 1) AC 800M via MODBUS TCP and/or 2) via OPC DA / Multiplexer Connect.

1) Connectivity to the controller would typically be used in a 'wireless' solution where HART 7 or the latest HART-supported standard devices are sending back PV data at 1-30 second update rates for monitoring and/or non-critical control.

Read more in Definition section

2) Connectivity via the HART Multiplexer Connect would be more applicable for retrieving diagnostic data from existing, already-installed and previously 'untapped' HART instruments. These are most likely still HART 5 standard, retrofitted with a 'wireless adapter' directly into an 800xA connectivity server to allow device management and/or asset optimization.

Pepperl+Fuchs (P+F) is a leading developer and manufacturer of electronic sensors and components for the global automation market headquartered in Mannheim, Germany. P+F's wireless gateway will not be re-branded. However ABB has an arrangement to purchase the gateway from P+F.

WirelessHART
System 800xA Extended Automation
The power of integration – Continued

One supplier, ABB

ABB Field Key adapter, together with System 800xA 5.1, provides a single-source solution opportunity. This 'adapter' is intended to be added to an existing WirelessHART device that is already connected to a DCS via an analog input, i.e. is being powered already. The adapter will then get its power from the existing connection. ABB Measurement Products is developing battery powered pressure and temperature instruments with versions using energy harvesting.

Wireless is not 'plug and forget'

Wireless field networks is a relatively new technology that is rapidly gaining acceptance due to the value it gives end-users. It is nevertheless important to realize that for it to be reliable and secure, a number of issues must be considered. These include matching the technology required to meet user requirements, site assessments for the design and installation of the required wireless infrastructure, and the importance of a site or company-wide wireless strategy to monitor how wireless solutions are handled and maintained.
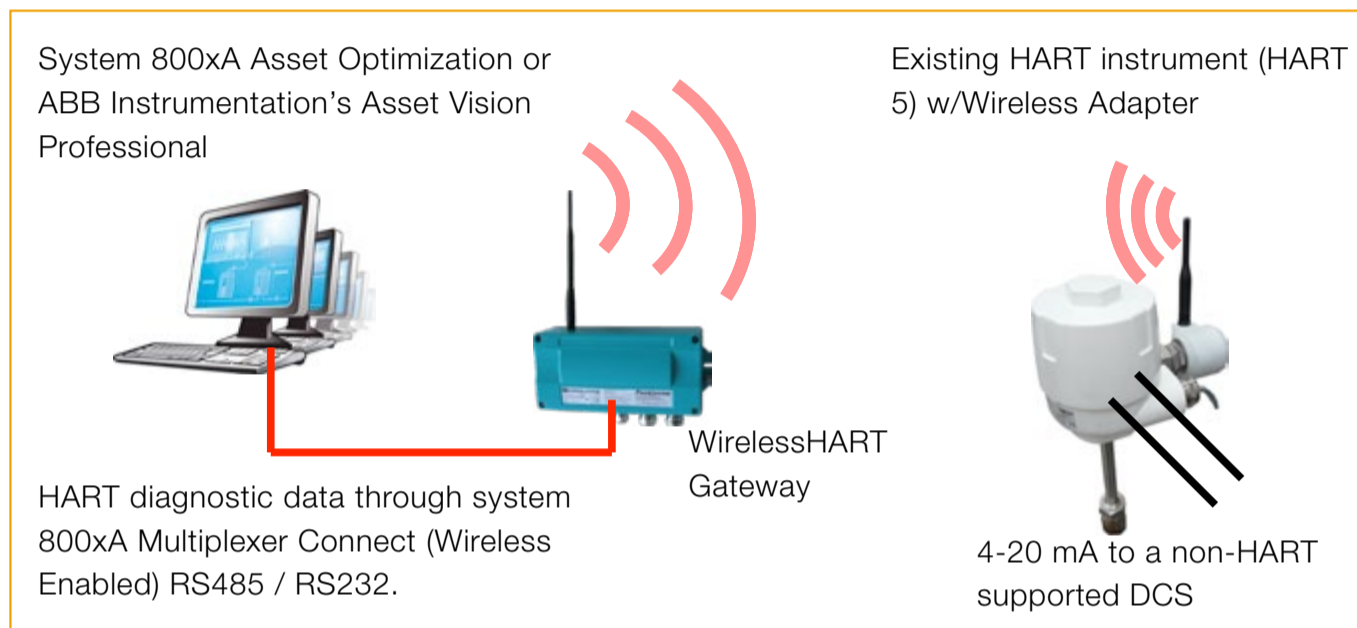
ABB Consult IT has experts to help you make the right choices in the area of wireless solutions. For example, the group has services available to help you determine what's a suitable wireless solution, radio planning/readiness, site measurements for gateway locations, and lifecycle planning, including 'radio management'.
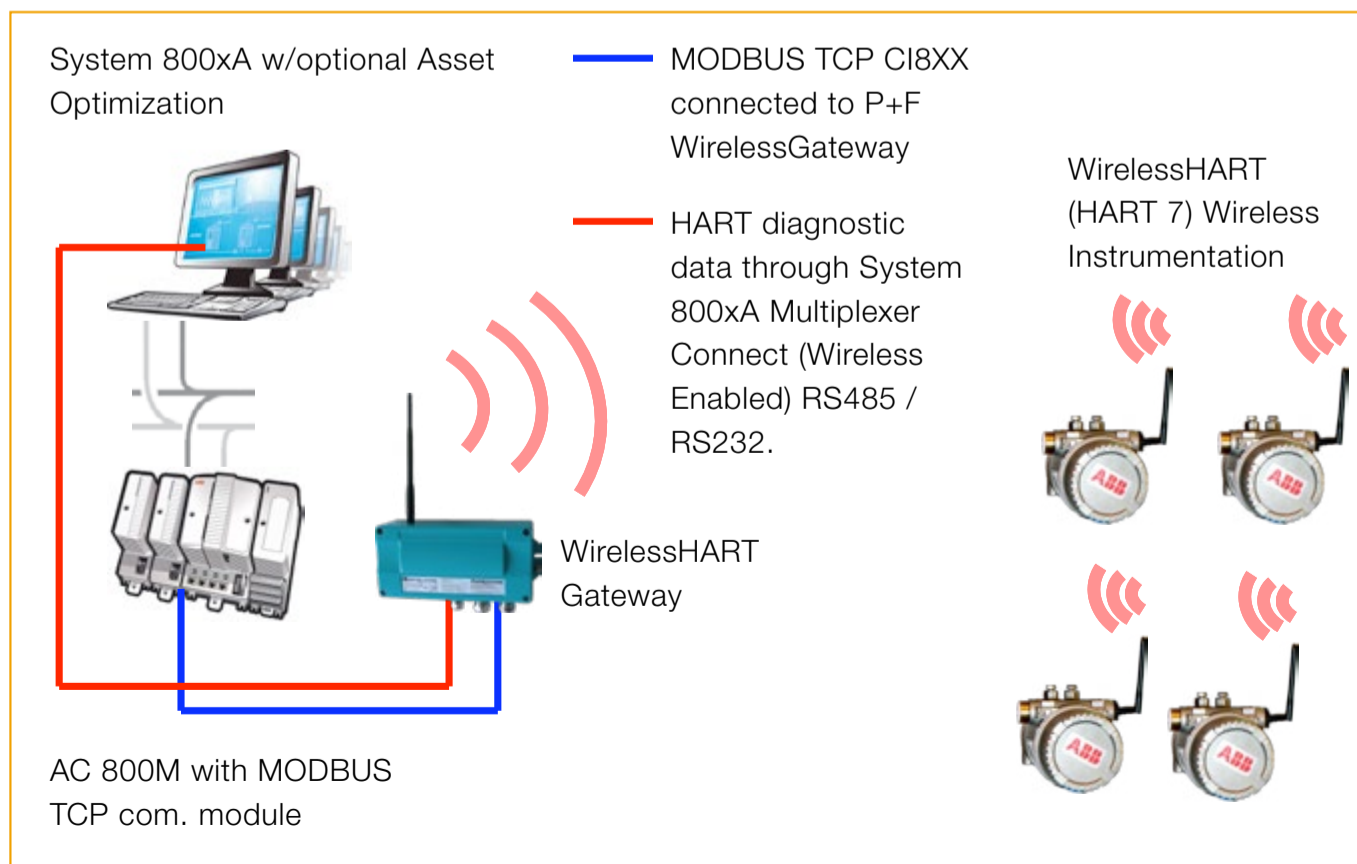
WirelessHART
Typical applications

Example 1:

Obtaining diagnostic data from installed HART transmitters (those already connected to a 4-20 mA signal in a non-HART supported DCS) for Device Management and possible Asset Optimization.

System 800xA Asset Optimization or ABB Instrumentation's Asset Vision Professional

Existing HART instrument (HART 5) w/Wireless Adapter

WirelessHART Gateway

HART diagnostic data through system 800xA Multiplexer Connect (Wireless Enabled) RS485 / RS232.

4-20 mA to a non-HART supported DCS

Example 2:

WirelessHART used to pick up new signals in a facility (such as a tank farm or measured signal with local gauge) where the process variable is needed in the controller and, optionally, the HART diagnostic data needs to be accessed in System 800xA along with Asset Optimization monitoring.

System 800xA w/optional Asset Optimization

MODBUS TCP CI8XX connected to P+F WirelessGateway

HART diagnostic data through System 800xA Multiplexer Connect (Wireless Enabled) RS485 / RS232.

WirelessHART (HART 7) Wireless Instrumentation

WirelessHART Gateway

AC 800M with MODBUS TCP com. module

WirelessHART
Typical applications – Continued

Example 3: Heritage system with no HART support

Traditional HART support is added to Heritage systems via a HART multiplexor. The multiplexor is often installed in the marshalling cabinet and requires significant re-wiring.

Adding wireless allows access to all HART information
– Point-by-point upgrade
– No marshalling cabinet rewiring
– Process and Asset monitoring
– Multivariable flow
– Flow – Total – Density – Temperature
– Position
– Feedback
– Diagnostics

PV monitoring with local power

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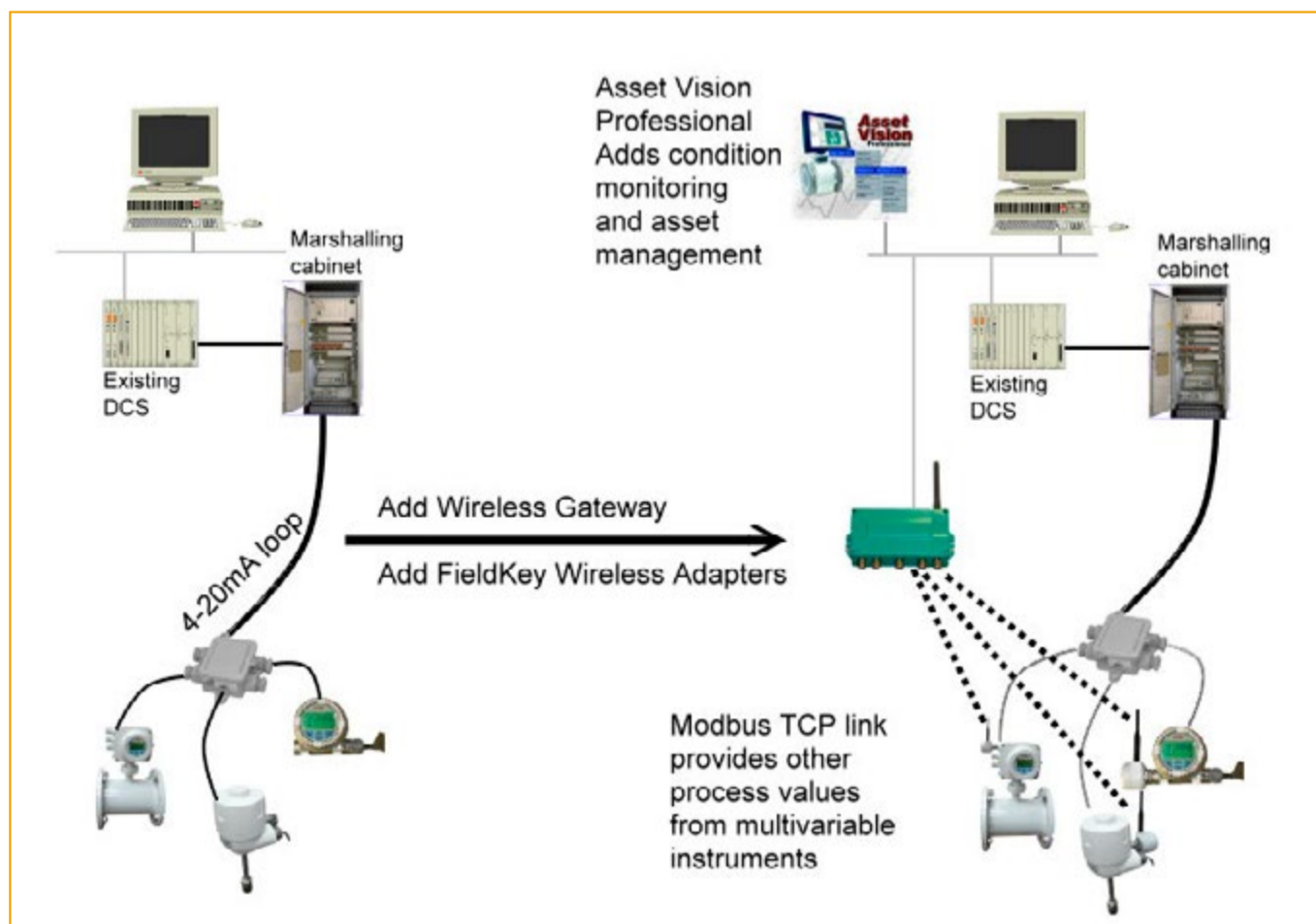
WirelessHART
Typical applications – Continued

Example 4: Skid modules

– Skid modules are prebuilt with I/O and PLC control
– Connected to system via serial bus (modbus)
– No access to instrument data
– Add FieldKey and a Gateway
– Use AVB or AVP to the host or direct to System 800xA
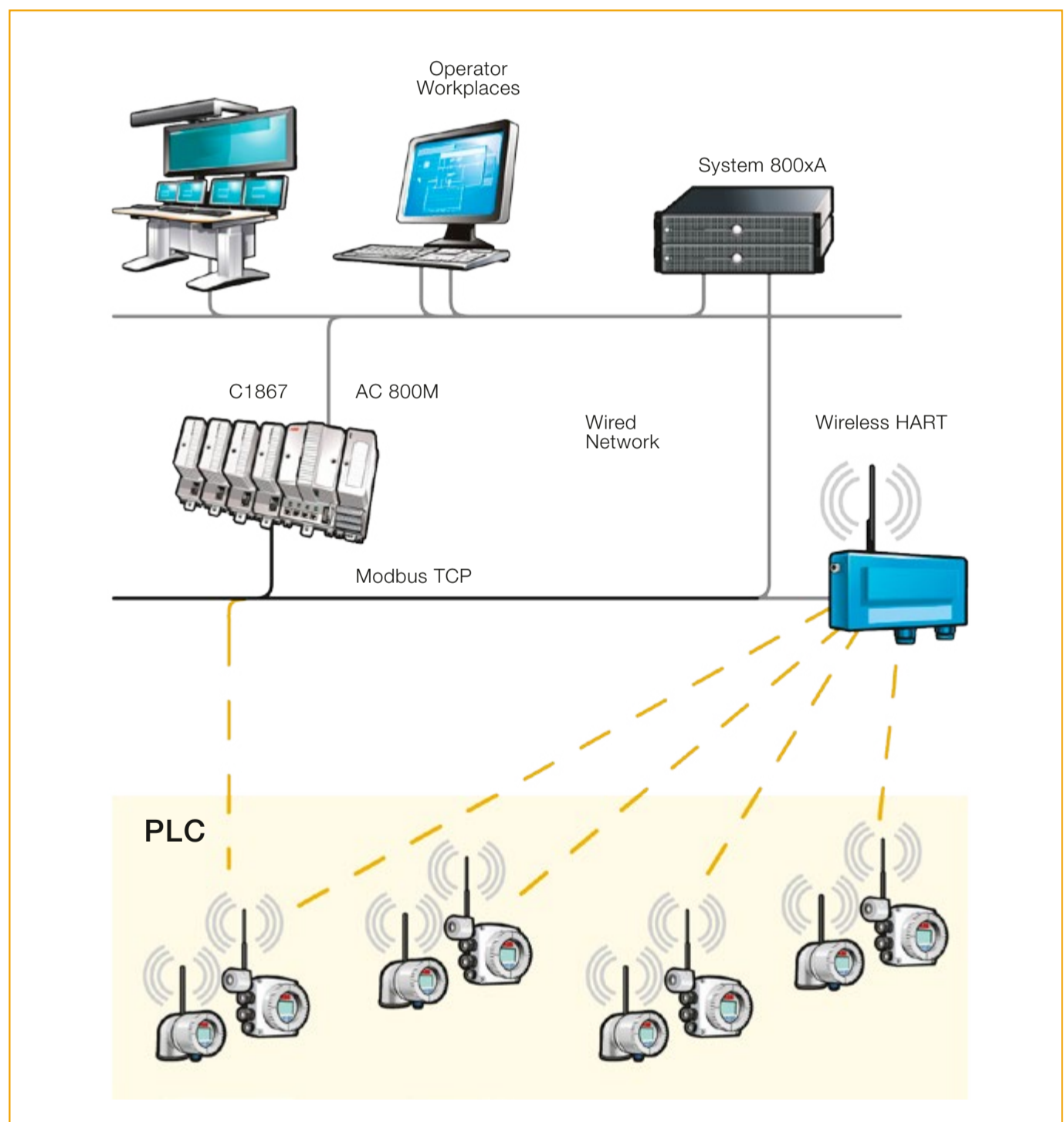
Alarm management

With fewer operators controlling ever-larger process areas, effective alarm management is essential for protecting the plant, its workers and the surrounding environment. As EEMUA 191 states, "each alarm should alert, inform and guide, every alarm presented should be useful and relevant to the operator, and every alarm should have a defined response".

Alarm management
Executive summary

What's the problem?

Too many alarms. During the design phase of most processes, alarms are often not considered a priority. In an effort to be safe, too many alarms get configured and as a result, many plants run with exceedingly high alarm rates. Operators become overloaded, which jeopardizes the safety, quality and productivity of their processes. Even when an experienced operator becomes overloaded with alarms, he is forced to act reactively to the current situation instead of proactively by using alarms to help prevent problems from arising. In reality, an alarm should only be generated when action is required.

The problems keep coming: nuisance alarms and standing alarms. Operators hammering the acknowledge key to end incessant alarms is a common sight in too many plants today. ABB Engineering Services metrics indicate that 97% of all new nuisance alarms come from one of three sources: a fault in the instrumentation, a process change, or a minor project. Additionally, many plants experience alarm bursts during certain phases of production, e.g. startups and shutdowns.

Not taken seriously until there's an incident. Because the benefits of alarm management are not tangible and immediate, alarm management often gets pushed aside for more financially promising projects with visible benefits. Taking on a project like alarm management is often overwhelming, and companies have difficulty developing a good alarm philosophy that encompasses every aspect of alarm management.

Creating and maintaining an alarm management strategy is hard-to-sustain overtime if not incorporated into everyday work processes.

How can System 800xA help?

System 800xA's alarm management capabilities, coupled with its ability to integrate and consolidate information from various sources, empowers plant owners to implement alarm management strategies, take action and continuously improve plant performance.

Alarm management
Definition

What does alarm management consist of?

Alarm management is not a product, a feature set, or a one-time project. It is a journey that takes time, with the end result being safe operation, safety for people, and protection of company assets. The key part of adopting an alarm management system is having a philosophy of how alarms will be handled, together with procedures, roles and responsibilities.

A good alarm management strategy is one that gets everyone involved – from operators to plant managers, follows a proven process and guidelines, and uses the best and latest technology. The system should be able to quickly provide information to operators – helping them to find the problem and restore the plant to normal operations. According to ISA 18.2, in order to provide adequate time to respond effectively, an operator should be presented with no more than one to two alarms every ten minutes. Additionally, routine maintenance and audits need to be incorporated into everyday work processes in order for the alarm management system to be effective. Alarm management will help avoid catastrophic incidents and keep the plant running close to optimum conditions.

Common definitions and terms

- Alarm Philosophy – Documents the objectives of the alarm system and the processes needed to meet those objectives. Defines an alarm, its priorities, classes, performance metrics, performance limits, and reporting.
- Alarm Identification – The need for an alarm, according to the alarm philosophy, has been recorded.
- Alarm Rationalization – The process of applying the requirements for an alarm and generating the supporting documentation, e.g. the basis for an alarm setpoint, the consequence, and corrective action that can be taken by the operator.
- Alarm Implementation – The physical and logical installation and functional verification of an alarm. Operator training is crucial during alarm implementation.
- Alarm Operation – The alarm is active and performs as intended. Refresher training on the alarm philosophy is included.
- Alarm Maintenance – The alarm is not operational but is being tested or repaired. Periodic maintenance is required to ensure the alarm system functions as intended.

Alarm management
Definition – Continued

Recognized guidelines

Alarm management has become such an integral part of proper plant main-tenance that international guidelines have been developed:

Engineering Equipment and Materials User's Association (EEMUA) 191	International Society of Automation (ISA) 18.2
European based	Describes the lifecycle approach to alarm management
Guidance on designing, managing and procuring an effective alarm system	Alarm system models
Details alarm design and different risk assessment approaches	Alarm philosophy, Identification, Rationalization, Implementation, Operation & Maintenance
Alerts and specification for alarm systems	HMI design for alarm systems
Alarm display designs and field sensors	Enhanced and advanced alarm methods
Philosophy, principles & implementation of alarm system design	Monitoring and assessment
Alarm management in batch plants	Management of Change
Alarm system improvement process	Audit

Alarm management
Value proposition

Who should care most about alarm management?

– Operators
– Plant Managers
– Engineers
– System Administrators
– Maintenance Technicians
– Instrumentation and Control

> The end goal would be that operators can create a work order immediately to fix a specified alarm, saving time and increasing the speed of resolution.

What is the value of alarm management?

It is difficult to prove the benefits of having an alarm management system. In addition, it takes a long time to collect and analyze data and really see a significant change in the working environment.

Alarm management helps avoid disastrous situations and encourages operators to act more proactively. Operators should know exactly what has happened and in what order so that they can deal with it in the best way. Optimizing an operator's ability to monitor processes means that they can be entrusted with larger sections of the plant without compromising safety. This lowers costs and gives owners the opportunity to reduce the control room footprint or consolidate several units into one for greater efficiency.

The consequences of not having alarm management can be serious. If a disaster should occur, without a log of alarm information or following the standards, a company could face serious legality issues, not to mention loss of company assets, environmental damage, and the impaired safety of employees.

A good management system can help the plant run closer to optimal conditions while avoiding downtime, maintenance and bottlenecks.

Alarm management is also a great way to test the safety of a facility. In the US, the Occupational Safety & Health Administration (OSHA) is beginning to monitor alarm management system usage. If a company has invested time and money in an alarm management system, it signifies the value they place in the safety of their employees and company assets.

Alarm management
System 800xA Extended Automation
The power of integration

How can System 800xA help?

System 800xA's alarm management capabilities, coupled with its ability to integrate and consolidate information from various sources, empowers plant operators to implement alarm management strategies, take action and continuously improve plant performance.

System 800xA Alarm management – key highlights

– Alarm analysis optimizes alarm implementation, optimization and use
– Structure-based alarms simplify assigning operator responsibilities
– Operator-friendly alarm lists promote quick and simple navigation
– Alarm shelving and hiding reduce operator distraction
– Alarm grouping minimizes alarm list entries
– Consistent right-click navigation makes alarm-related information instantly available

Optimized alarm presentation

System 800xA's ability to personalize how alarms are presented to the system user is the most flexible in the industry. Alarm lists and alarm bands can be shown separately or together in an operator workplace for outstanding notification of abnormal situations.

How an alarm is presented dictates how effectively it is handled. System 800xA Alarm management makes the most of this opportunity. For example, operators can acknowledge all visible alarms, and enter comments for individual alarms that are recorded in the events list. Navigation to the corresponding event list is simple and direct. Note that a status presentation summary (alarms acknowledged, unacknowledged and inactive) is always on show. Predefined operator filters can also be configured.

System 800xA's alarm lists have runtime and pre-configured filtering capabilities, along with world-class features such as showing the current value of the tag in the alarm, as well as dragging and dropping the alarmed point into a trend to let operators better understand the current situation.
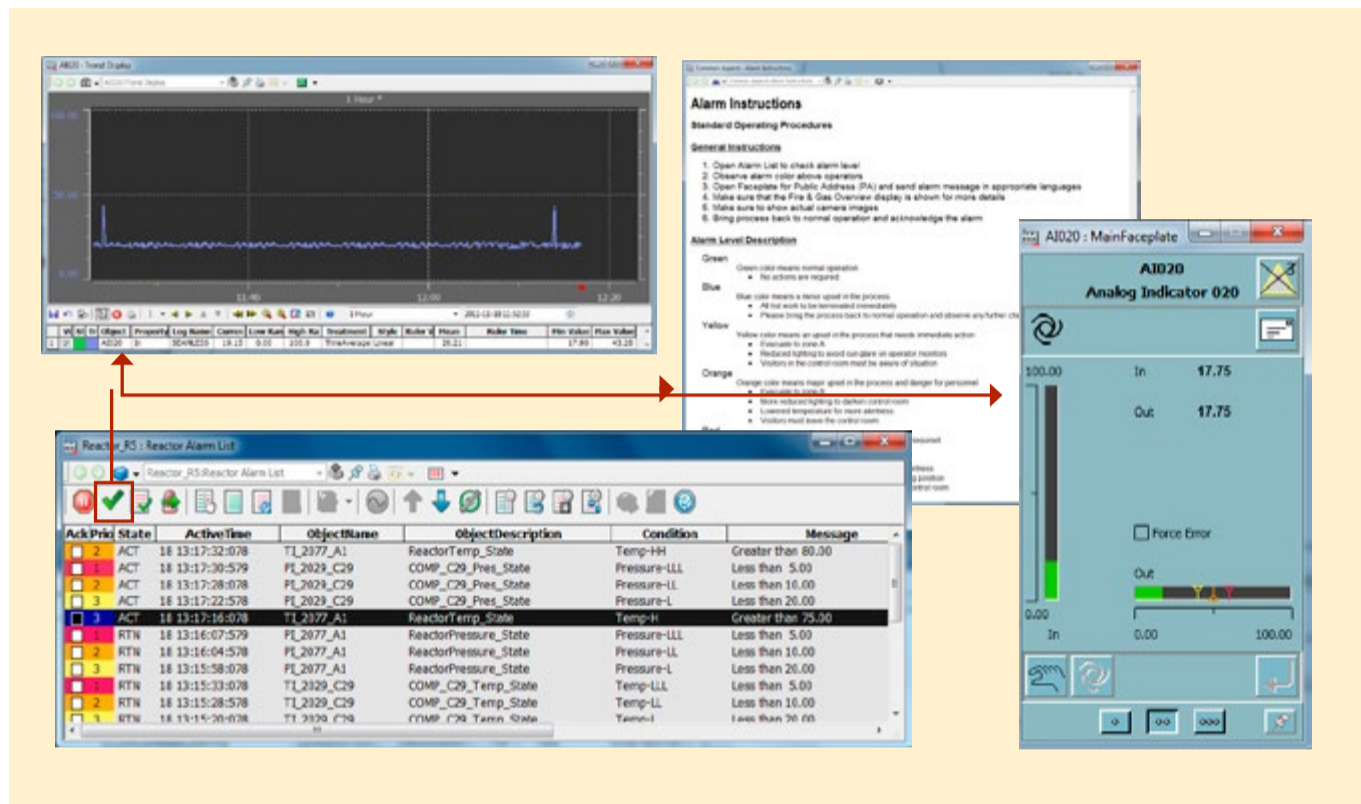
Alarm management
System 800xA Extended Automation
The power of integration – Continued

System 800xA alarm management provides fast navigation from an alarm (via the Alarm and Event list or the object context menu) to the detailed information needed to handle it correctly.

Finally, alarms can be filtered based on category and presented separately to the operator. This is especially useful when needing to separate process alarms from device diagnostics or batch messages from system status messages, for example.

Alarm Analysis

Alarm management
System 800xA Extended Automation
The power of integration – Continued

Alarm navigation

Using System 800xA's unique aspect object technology, navigation from an alarm list to informative and/or actionable displays is easy and intuitive. Faceplates are directly called up when selecting an alarm in a list, and with the aspect menu, a filtered list of displays is available to keep operators well informed. Examples include documents that provide cause, effect and recommended action data or AOA information (Alarm Objective Analysis), trends, graphics where the tag in alarm resides, individual tag alarms, and event and audit trail logs, etc. In addition, an alarm Response feature allows users to pre-configure up to four displays that are automatically invoked when selecting the alarm. This gives even faster access to the information needed for decision making.

Alarm management system benchmarking

System 800xA reduces the need for a third-party alarm and event historian since it can analyze alarm system key performance indicators, e.g. those listed in EEMUA 191 and ISA SP18.2, within the system itself. The Alarm Analysis feature in System 800xA can examine any number of alarm lists (i.e. on the plant level all the way to individual tag) to indicate the top 20 alarms that come in, number of standing alarms, priority distribution, average time to acknowledge, etc. These statistics can be seen by generating a report through System 800xA's scheduler or via MS WPF based graphics. This is especially useful if operators are involved in alarm management strategy processes.

Dynamic alarm handling removes unnecessary distractions

In some cases, alarms need to be handled differently for various reasons, such as a changing plant state. This helps reduce the risk of alarm flooding (too many alarms presented to the operator at one time) or the occurrence of potential attention-stealing nuisance alarms. System 800xA features such as alarm hiding, shelving and grouping allow the creation and implementation of an advanced alarm management strategy.

Alarm hiding is set up during the engineering phase. Its main purpose is to suppress alarms that are either expected or not relevant in a particular situation, or that are based on a known process state, e.g. low temperatures or flow during a controlled shutdown. As the name suggests, 'hidden' alarms are never visible to operators. They only see alarms that require action on their part.

Alarm management
System 800xA Extended Automation
The power of integration – Continued

Alarm shelving lets operators decide whether or not to put an alarm 'on the shelf' for a defined period of time or a certain occurrence. This temporarily removes it from the main alarm list to a special list, but the alarm itself is not affected. It will later require attention from the operator. In the meantime, the operator can concentrate on tasks judged to require their immediate focus. Simple navigation makes alarm shelving a valuable and much-appreciated tool that helps operators work with maximum efficiency.

Alarm grouping replaces long lists. A group alarm is a single alarm that is presented instead of several individual alarms generally related to a common process unit or a similar operator response. By minimizing the number of alarm list entries that have to be read and assessed, alarm grouping helps operators work more effectively.

In addition, alarm grouping also lets operators understand the implications of a particular alarm for the process section under their control. By both reducing the number of alarms and making them more informative, alarm grouping helps operators concentrate on taking the correct counter-measures to prevent or reduce damage occurring.

Roy Tanner

▶ Alarm Shelving

Alarm management
System 800xA Extended Automation
The power of integration – Continued

In alarm systems that lack this function, the success of damage limitation has often depended on an individual operator's ability to 'piece together' the information from several simultaneous alarms, plus their experience of what this means for the process. This is both time-consuming and risky. With System 800xA alarm management, it is also unnecessary.

Client – Server role in alarm management – System 800xA is based on a Client-Server architecture, which is especially advantageous when dealing with alarm management. Firstly, a centralized alarm management system is better at keeping alarms synchronized between consoles than a node based architecture. Secondly, since the alarm system is synchronized, there isn't a separate 'tag list' or database that has to be downloaded to each console. Finally, a typical modern DCS implementation includes multiple controller platforms including PLCs, previous generation DCS controllers and modern flagship controllers. In this scenario, alarms are generated from these various controller platforms as well as other sources, such as higher level applications, and streamed into the alarm and event system of the DCS. In this situation, implementing a world-class alarm management strategy using methodologies such as dynamic alarm handling would be very complex, since every controller has its own way to 'inhibit' alarm conditions. Managing a real system with multiple platforms and alarm sources would be extremely difficult to engineer, document, and maintain over time. With System 800xA's client-server architecture, where alarms are managed centrally, alarm handling such as alarm hiding, shelving, grouping, etc, can be dealt with using one tool and one way at the operator level regardless of initiation. This also makes documenting and maintaining the solution significantly easier, which will improve management of change and reduce the risk that comes with a poorly managed alarm management system.

Potential services available from ABB

ABB's approach to alarm management is user-focused and does not rely on a specific standard or guideline, although projects have been delivered with both ISA 18.2 and EEMUA 191 guidance. This approach ensures that all aspects are assessed, including the operational environment rather than just the technology.

Alarm management
System 800xA Extended Automation
The power of integration – Continued

800xA specific services:

– Consult IT – A global community of ABB experts offering coaching ser-
vices and software solutions for 800xA. This includes ISA compliance
assistance, alarm analysis, program audits, alarm philosophy, dynamic
alarm handling, rationalization assistance, management of change and
intelligent notification.

General ABB alarm management services (non-system specific)

– Alarm management fingerprint – Benchmarks current performance levels
and provides a basis for evaluating and identifying improvement oppor-
tunities. Optionally, an improvement plan with recommendations for cor-
rective actions prioritized by severity and effort required.
– Alarm management training – Training on alarm management fundamen-
tals, awareness, and best practices based on EEMUA 191.
– Alarm rationalization support – Experienced professionals work with
plant staff to form an ongoing alarm management process that conforms
to best practice. Results in improved operations and maintenance.
– Alarm philosophy document development – ABB professionals collabo-
rate with plant staff to write a formal alarm philosophy that establishes
definitions and a management of change procedure.
– Alarm management solution integration services – After a health check
to measure performance and recommendations for action has been
made, ABB helps implement the required solutions.

Alarm and asset
management

▶ 800xA with EOW-X Alarm
and Asset management

System 800xA
Extended
Automation

Operator
effectiveness

Automation and
power integration

Integrated
safety

Enterprise
asset management

Fieldbus
technologies

WirelessHART

Alarm
management

Executive
summary

Definition

Value
proposition

System 800xA
Extended
Automation

Key
specifications

Typical
applications

Virtualization

Cyber
security

Evolution

Miscellaneous

Alarm management
Key specifications

When specifying alarm management systems, there are a number of things to think of:

– The automation system should have built-in alarm analysis benchmarking.
– A separate node should not be needed for alarm analysis benchmarking.
– No additional engineering should be required when adding a new tag to the system.
– Alarm analysis displays should be available in the HMI for operations and engineers to easily access the status of the alarm management key performance indicators.
– Navigation from alarm analysis displays, such as Top 20 alarms, should be possible. For example, by selecting the most frequent alarm, the tag and other tag-related displays should be available.
– Alarm management features should include, but not be limited to, alarm analysis, alarm shelving, alarm grouping and alarm hiding.
– The ability to remove alarms from the operator view during various plant conditions should be possible without having to disable or inhibit alarms in the controller.
– To provide better operator decision support and reduce time to action, up to four displays should be invoked when an alarm is selected in an alarm list and displayed in a pre-determined location on the operator process display.
– Alarm, event, and audit trails list should be configurable and available on the instrument, tag, unit, area or plant levels.
– Alarm, event, and audit trails lists must include the capability to be filtered in runtime, have pre-configured filters, and have the current value of the tag in alarm visible.
– Alarm, event and audit trail lists should be able to be located anywhere on an operator workplace (i.e. top, bottom, right, left) to match the user's operational philosophy.
– Alarm notification should be available to the operator through the following options:
    – an alarm line(s) on the main operator display
    – alarm bands showing the highest priority unacknowledged alarm. NOTE: Alarm band shall also indicate hidden (suppressed from the operator's view) and/or shelved alarms (operator-initiated timed suppression)
    – operator display navigation tabs
    – indications on tags in a process display

Alarm management
Typical applications

To understand some of the advanced features, several examples of their use are given below. Note that these are only a few examples, and that end-users may have different requirements based on their own strategy or the problem they are trying to solve.

Alarm hiding

Alarm Hiding can be used to remove certain alarms from a part of the plant that is shut down. When a portion of the plant is shutdown, various alarms may be triggered, e.g. low pressure or low temperature. These would be considered a nuisance to an operator. A script could be developed, or a simple button made available for a shift supervisor to select, that detects this down unit or plant area and hides the alarms so that they not detract the operator's attention from running other parts of the plant.

Alarm shelving

If a transmitter is known to be malfunctioning and the maintenance technician is working on it, an operator may want to 'shelve' the alarm for two hours until it is fixed. The alarm will be automatically unshelved after this period. If the transmitter isn't fixed, the operator can re-shelve the alarm.

Alarm analysis

Alarm analysis can be used in different ways. Example 1: Alarm analysis can be configured to look at an operator's area of responsibility to determine if he/she is overloaded, and to gather statistics that will help develop a corrective strategy. Example 2: Alarm analysis could be used to point to a unit and deliver runtime displays to a senior operator or shift supervisor to determine the 'bad actors' via the Top 20 alarms display or chattering alarm display. These bad actor tags will then be submitted or discussed in production meetings, or submitted for maintenance on a weekly basis as part of the alarm management procedures listed in the alarm philosophy document.

Alarm management
Typical applications – Continued

Alarm filtering

Example 1: During a plant disturbance, many alarms may be generated. This function lets an operator call up the main alarm list and select a pre-configured alarm filter that shows only the highest priority alarms. This allows him/her to address critical alarms first and then deal with lower priority alarms when the situation is under control.

Example 2: An operator is handing over the process to another operator and reviewing the current alarm list. A situation occurred with a certain tag, which the operator wants to show the next shift's operator. He/she selects the 'tag name' header or calls up the runtime filter dialog to filter the alarm list alphabetically and scrolls until the tag in question is found.

Alarm response

A plant owner wants to control what operators look at when critical alarms are triggered. The area graphic, faceplate, trend, and recommended alarm action gets invoked when an operator selects the alarm. Alternatively, the operator can select this from the aspect menu wherever the tag is on a graphic.

Alarm grouping

A plant owner wants to create 'trip' alarms that represent lists (groups) of 20-30 tags to reduce the risk of operators getting overloaded from alarm bursts and missing alarms that need their attention. When anymore than one of the tags in a group goes into an alarm condition, the trip (or group) alarm is generated and the individual tag alarms are removed from the operator's view. A group alarm list can be accessed by the operator to see the first alarm out and which tag alarms are active and unacknowledged.

Virtualization

Virtualization brings many cost and operational benefits by simplifying how servers are managed and maintained. It drastically reduces the amount of hardware and operating expenses, and it increases availability. Software upgrades are easier to install, which promotes wider use of improved control technologies and functionality. By helping raise the level of plant automation, virtualization increases productivity and optimizes energy use.

Virtualization
Executive summary

There's got to be a better way
The use of commercial off-the-shelf (COTS) PC technology was driven by users of DCS systems decades ago and was then considered to be the best solution. Many positive things came out of this but it also produced issues such as server maintenance and shorter equipment lifecycles, the latter mainly due to a fast-moving PC industry. Today there is a better way.

The solution is 'virtually' right in front of you
Virtualization is a technology that enables running multiple operating systems inside virtual machines (VM) on the same physical computer. A VM is a software program that emulates a computer and its hardware components (CPU, RAM, disk drives, network adapters, etc.). Microsoft® Windows® can be installed and run on a VM. The VM appears to the operating system as physical computer hardware. This technology can now be used for Industrial Automation applications.

The value of virtualization is 'real'
Virtualization brings many cost and operational benefits by simplifying how servers are managed and maintained. It drastically reduces hardware numbers, operating expenses, and it increases availability. Software upgrades are easier to install, which promotes wider use of improved control technologies and functionality. By helping raise the level of plant automation, virtualization increases productivity and optimizes energy use.

System 800xA Extended Automation – The power of integration
ABB System 800xA has a pre-tested, validated architecture that can run VMware ESX virtualization software. This lets 800xA systems run multiple 800xA nodes in a single hardware server!
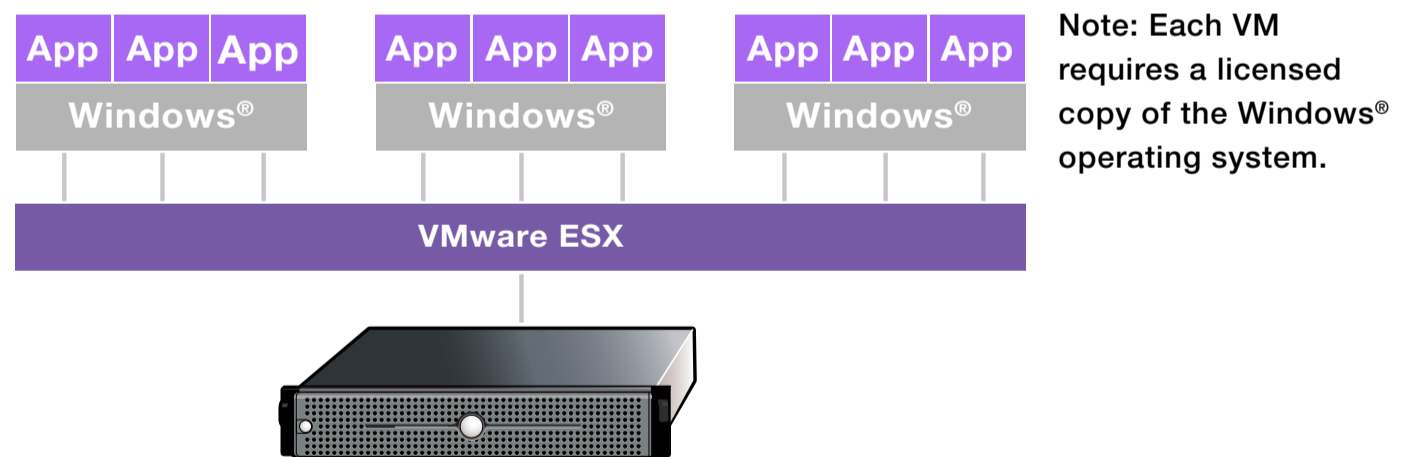
Virtualization
Definition

What is virtualization?

Virtualization is when software is used to simulate hardware. In this way, a single physical PC machine can behave like a set of physical machines, i.e. provide multiple virtual machines. Each virtual machine is provided with a CPU, RAM, hard-disks and network adapters. Virtual switches provide the connections between the virtual machines and the physical network. With virtualization, different operating systems – old as well as new – will run on the same physical computer. Clients still use regular workstations and the normal physical control and client/server networks are unchanged.

There's got to be a better way

– Installing, maintaining and operating multiple servers and platforms is resource intensive (it requires people, energy and time).
– Lifecycle durations are too short concerning PC and software technologies which cause unnecessary or postponement of upgrading during plant outages.
– Installation and recovery times for systems can be too long and therefore expensive.
– Technical support can be inefficient when remote support is lacking and having to sending files back and forth.

App	App	App		App	App	App		App	App	App
Windows®				Windows®				Windows®		

VMware ESX

Note: Each VM requires a licensed copy of the Windows® operating system.

Two examples of companies that supply this technology are VMware (ESX) and Microsoft (Hyper-V). VMware has about 80% of the market for virtualized servers.

Virtualization
Value proposition

Less hardware means more savings
The most obvious benefit of virtualization is the hardware optimization gained from server consolidation. Reducing the amount of hardware saves on purchasing costs, related equipment costs (network switches, cabling, cabinets, e.t.c.), space costs and power and cooling costs.

Conventional servers are notorious 'energy thieves', with a large electricity consumption. Virtualization saves up to 50% of these costs. The working environment also benefits from greatly reduced noise levels.

Management and maintenance benefits
Virtualization greatly simplifies server management. Recent years have seen a trend for progressively increasing the numbers and types of servers. Maintaining all the spare parts needed is a major task in itself. Virtualization cuts this dramatically.

Less hardware variations and configurations result in easier manageability. Virtualization presents one standard hardware type to all of the virtualized servers. One software tool manages all relevant parts, including network devices and connections. Everything is in the same place in the computer.

You can easily add additional servers and migrate to new hardware without reinstalling.

This simplified server administration gives a far better overview and control of the computing environment. Issues that could affect production can be identified quicker and remedied faster.

With virtualization, IT and Production departments can utilize the same type of computing environment and benefit from shared skills and resources. This makes more harmonized use of in-house computing skills.

You can enjoy all of these management benefits with the same high-level performance as before. Moreover, virtualization makes it easier to introduce new server technologies, thus providing a further boost to system perfor-mance. System security is also handled in the conventional way, but once again virtualization offers improvement opportunities. For example, VMware vSphere ESX provides additional security permission controls that reduce the potential interference of the virtual machines.

Virtualization
Value proposition – Continued

Smoother installation and upgrades

The simplicity and flexibility of a virtualized computer system brings further benefits when installing and configuring new software. Upgrading becomes more efficient. The complete upgraded system can be set-up, tested and started in parallel with the running version, which reduces upgrade costs and shortens production downtime.

Virtual machines also make it easy to copy a server for training. Training on a copy of the production system improves safety and helps raise competence levels. It is also an excellent way of verifying that you have a complete back-up of the running system should the need arise.

Disaster recovery made easy

Failure of a server is never welcomed but with virtualization, this is no longer a major issue. Previously, the same hardware type was required to restore backup images. If not, you could face a very costly, step-by-step installation to start it up again. With the hardware independence that virtualization provides, virtual machine backups can be started on an available ESX server. Once more, a virtualized server environment makes maintaining your system trouble free.

Who should care most about this technology?

– Control System Engineers
– System Administrators
– Maintenance Managers
– Plant Management

Typically, the engineering groups responsible for DCS maintenance will drive this technology

Virtualization
System 800xA Extended Automation
The power of integration

What value does System 800xA provide?
The use of virtualization has expanded dramatically in the business and financial sector amongst others. ABB now provides the ability to take advantage of virtualization in process industries.

ABB and System 800xA enable customers to utilize modern technologies such as virtualization. This provides a smaller footprint, with lower maintenance costs while at the same time increasing availability in a pre-tested, supported environment.

Full support for virtualization technology
ABB has chosen VMware ESX. It can be used in 800xA systems to combine multiple 800xA server applications on a single computer. The total number of physical computers required in an installation is reduced significantly. This also reduces the required space for computers, hardware acquisition cost for computers and cabinets, and operating expenses (such as energy costs).

Ensuring that virtualization benefits are maximized
System 800xA can achieve higher availability and functionality with the use of less hardware when installed in a virtualized environment. This is achieved due to System 800xA's software architecture and inherent server redundancy. Maintenance is also less resource dependent due to centralizing access through the VMware console. Via this console, the status of each server and virtual switches is presented and can be accessed from a centralized location.

System 800xA node types supported to run inside VMs:
– All 800xA Server node types are supported to run inside VMs.
– Operator clients are supported to run inside VMs as virtual clients or virtual terminal servers.

Please check product information for limitations.

Servers from HP, Dell and IBM have been approved. Please check the latest product information for any changes.

System Server Applications
Domain Controller
Aspect Server
Connectivity
Applications
(Batch. AO.IM)

Virtualization
System 800xA Extended Automation
The power of integration – Continued

Smoother installation and upgrades

Virtualization allows ABB to deliver systems that not only provide excellent energy savings and reduced hardware footprints, but also enable efficient support and maintenance of the system over its entire lifecycle. Patch deployment, server maintenance, software compatibility, and upgrades can all be executed more efficiently.
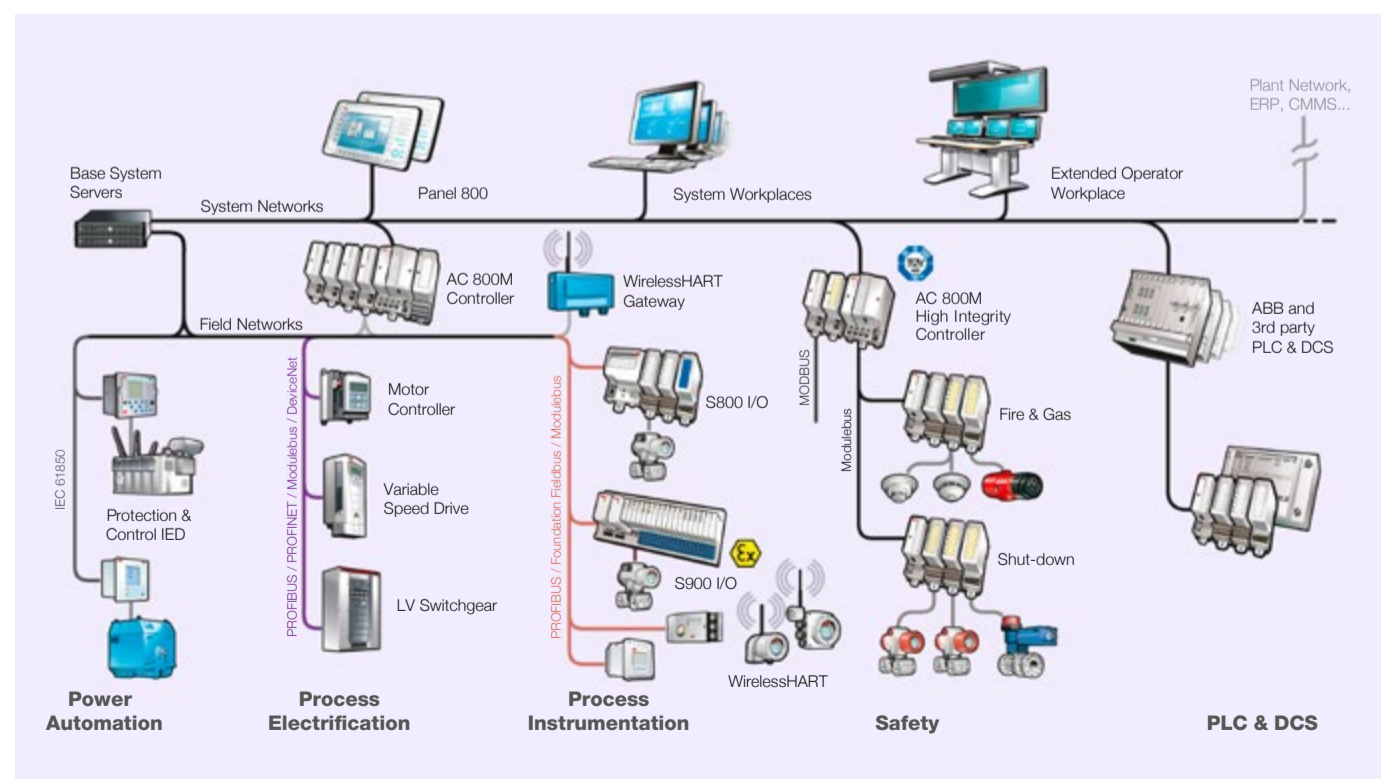
With Virtual Machines, System 800xA software can run in an environment that is completely independent from the underlying PC hardware. This brings new flexibility to control network maintenance strategies because now systems can be moved or updated without having to worry about the PC itself.

Higher availability and easier mantainance with Storage Area Network

Virtual machines can either be stored on hard disks localized in the ESX server, or on a network storage device such as a Storage Area Network (SAN) server. In both cases, the storage is added to the ESX server and seen as datastores.

One advantage of having the virtual machines stored on a SAN server is that they can be moved from one ESX server to another. Since both ESX servers have access to the same shared storage, only the execution context needs to be moved rather than the much larger virtual machine hard disk.

System 800xA – The power of integration

Virtualization
Key specifications

Sample Specification Items:

Use of software virtualization

– The Collaborative Process Automation System (CPAS) software shall have a standard, supported solution feature to allow for software operation within a virtualized server or workstation environment. At a minimum, system servers shall meet this requirement. Further CPAS virtualization should utilize enterprise level technology, not a proprietary or an in-house software solution.
RESPONSE: ABB System 800xA provides a standard, supported solution for virtualizing system servers using VMware vSphere software on ESX server hardware, and offers support for all 800xA node types.

– The system supplier shall provide detailed documentation on how this feature is supported by the CPAS system as an attachment to the response to this specification.
RESPONSE: Documentation for System 800xA includes detailed planning and implementation information for using virtualization. A copy of the documentation is included in the supplemental information provided with this specification response.

Virtualization
Typical applications

Lifecycle cost comparison for 8 node system shown in the example:
Initial hardware savings with a virtual environment are 33% with continued savings in operating and energy costs throughout the PC lifecycle (annual savings upwards of 43%). Total energy savings over the 5 year lifecycle are 10.49 kWatts and total Carbon Emissions are cut by 120,054 lbs (54.4 tons).
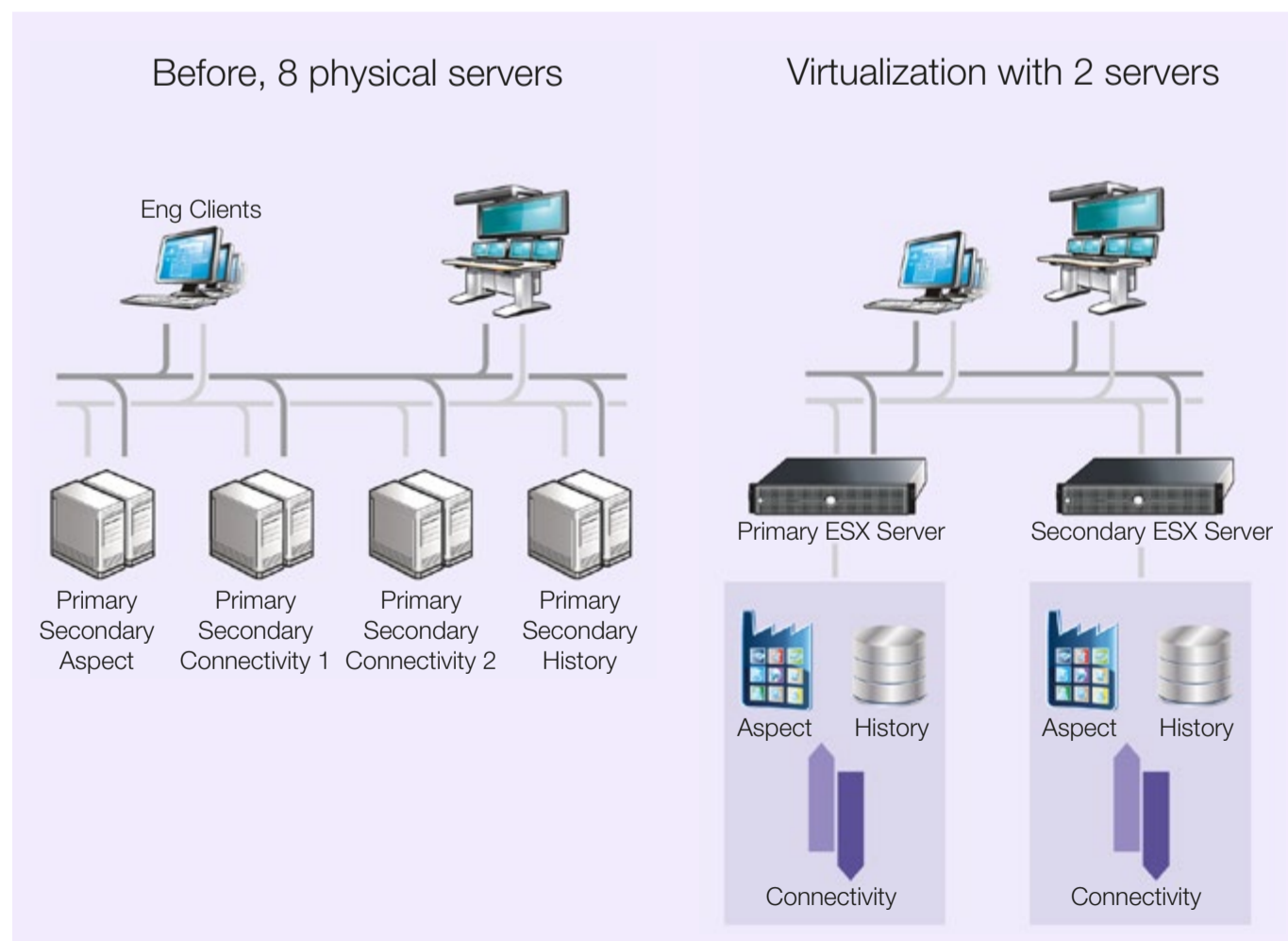
Hardware cost comparison for 14 node system:
Initial hardware savings with a virtual environment are 56% with continued savings in operating and energy costs throughout the PC lifecycle (upwards of 65% per year). Total energy savings over a 5 year lifecycle are 21.278 kWatts and total Carbon Emissions are cut by 243,442 lbs (110.4 tons).

Maximum savings for 16 nodes, large system:
Initial hardware savings with a virtual environment are 59% with continued savings in operating and energy costs throughout the PC lifecycle (upwards of 66% per year). Total energy savings over a 5 year lifecycle is 24.87 kWatts and total Carbon Emissions are cut by 284,580 lbs (129.1 tons).

Virtualization example – 8 node system

Before, 8 physical servers | Virtualization with 2 servers

Eng Clients

Primary Secondary Aspect | Primary Secondary Connectivity 1 | Primary Secondary Connectivity 2 | Primary Secondary History

Primary ESX Server | Secondary ESX Server

Aspect History | Aspect History

Connectivity | Connectivity

Virtualization
Testimonials and references

Server virtualization saves running costs and increases reliability at Mälarenergi (Sweden)

Mälarenergi operates one of Europe's most efficient heating and power plants, utilizing System 800xA for controlling the heat and power generation process. When the time to upgrade the system arrived, Mälarenergi decided to optimize its server hardware via a virtualization project run jointly with ABB.

Complex plant with high demand on reliability

This energy plant is a complex facility, and with so many consumers dependent on its output, high operational reliability is essential. The main boilers and turbines were supervised by System 800xA from the main control room supported by a number of servers, including process servers and servers to which computational computers were connected. All together, Mälarenergi operated thirteen servers directly related to plant operation. This was far from ideal in terms of running costs and management resources.

Server consolidation saved considerable costs

The most obvious benefit of Mälarenergi's virtualization is the hardware optimization gained from server consolidation. ABB's project proposal was based on greater operational redundancy and reducing the thirteen physical servers to just two, each with eight virtual servers, in two separate networks. By reducing the amount of hardware, Mälarenergi saves on purchasing costs, related equipment expenses (network switches, cabling, cabinets, etc.), space costs and power and cooling costs.

Smooth, problem-free implementation

The new system could be tested prior to installation. Several program versions ran on the same computer to ensure that everything worked as expected. Start-up was done without any interruptions to plant operation. The whole upgrade of System 800xA took just five months. Thanks to the virtual servers, the time needed to implement the System 800xA upgrade could be kept very short. "We ran online the whole time without any disruptions whatsoever," confirms Mälarenergi's Börje Horsell.

So far the outcome has been very positive. The servers themselves are more reliable. The risk of malfunction is greatly reduced, plus it is much easier to expand the system in the future.

Cyber security

The world of process automation is changing in the face of new opportunities and challenges. ABB remains committed to helping customers take advantage of technology advances while minimizing exposure to risk in areas like cyber security. As a leading provider of control systems for a wide spectrum of industries, ABB combines its technology strengths and domain expertise to provide a customer-focused solution that enhances asset productivity and efficiency.
The objective is to establish the necessary levels of cyber security and maintain that level, even in the face of challenges, while preserving the availability and functional interoperability of systems.

Cyber security
Executive summary

The need to maintain secure control

Industrial automation and control systems have evolved significantly over recent decades thanks to many technological advances and break-throughs. At the heart of these advances are specialized IT systems. To provide end-users with comprehensive real-time information and allow for higher levels of reliability and control, these systems have become more and more interconnected. New generation automation systems utilize open standards like TCP/IP and various web service technologies. This has brought substantial benefits in the form of improved information flow and efficiency; but it has also exposed these systems to the possibility of attack from viruses, hackers and terrorists.

It's important to maintain a secure and reliable control environment while expending minimal time and effort. Security has become a major concern for Industrial Control Systems. For Manufacturing and Control Systems in particular, the potential impact of a security incident includes endanger-ment of public or employee safety, loss of production, violation of regu-latory requirements, harm to the environment, and equipment damage. Implementing and maintaining a secure system is a challenging mission further complicated by the use of common industrial standards, technol-ogy advances, and the need for enterprise-wide connectivity to business systems.

The solution

There is no single security solution or technology that fits the needs of all organizations and applications. Similar to process and safety improve-ments, security needs to be a continuous activity, involving people and organizations as well as technical solutions. While the reality is that no security can be 100% effective, careful planning and implementation of security measures, based on a systematic risk assessment, can bring security to a level that is adequate for any particular application and installation.

ABB provides support and service for control system security throughout the complete life cycle, from installation and deployment via operation to maintenance. This includes advanced user access control and protection of computers and networks, as well as functions for secure installation, backup and restore, and for keeping the system up to date with relevant security patches.

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Cyber security
Definition

For many people, cyber security is a synonym for encryption. For others, the foremost cyber security issue concerns protection against computer viruses. In reality, however, cyber security has a much wider scope.

Why is cyber security an issue?

Modern automation systems are based on off-the-shelf technologies (e.g. operating systems) and use standard technologies for communication (Ethernet/TCP/IP and, in some cases, web technologies such as http). When such systems are connected to external networks, it becomes possible use known vulnerabilities in these technologies to attack them remotely, potentially even from the Internet. The easy use of portable storage media also makes it possible for malicious code to enter systems even if they are not connected to any external network. While these technologies have brought huge benefits from an operational perspective, they have also introduced cyber security concerns previously known only from office or enterprise IT systems. Cyber security risks were inherited by adopting open IT standards. Fortunately, so were the cyber security mechanisms that have been developed in a large number of enterprise environments to address these risks. Properly adapted to the specific needs these mechanisms allow the design and development of cyber security solutions for control systems.

Why is cyber security important for both vendors and plant owners?

Effective security solutions require a joint effort by vendors, integrators, operating system providers and end-users. Cyber security is not just a matter of technology, but primarily about people, relationships, organizations and processes working in tandem to prevent attack.
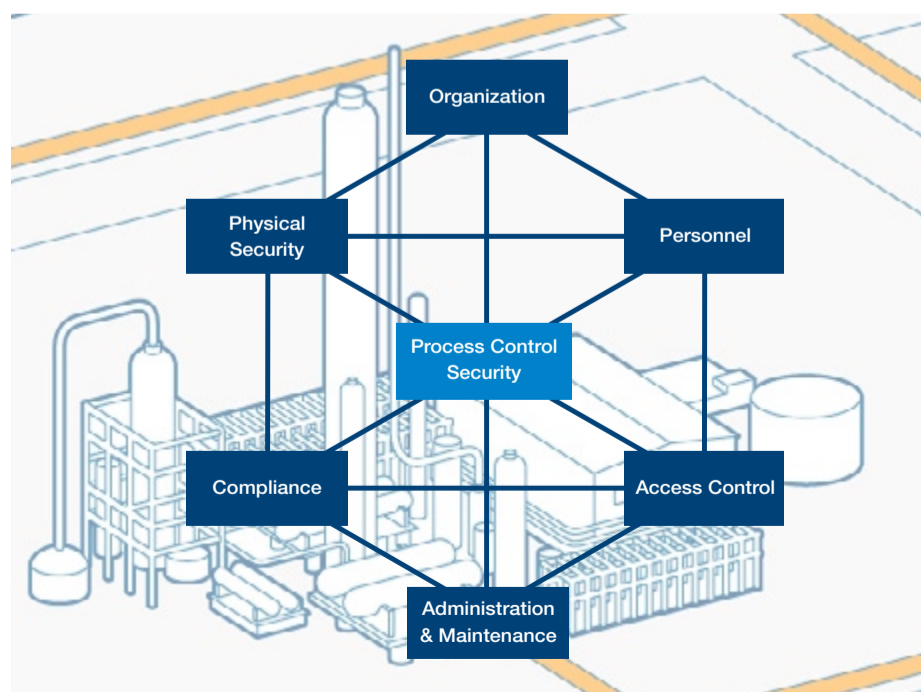
Many manufacturing facilities are more connected (and more vulnerable) than their owners and operators may think. Off-the-shelf technology has often been deployed without an adequate understanding of its impact on risk. This is not just a matter of technology – it's about people, relationships, organizations, and processes.

Cyber security
Definition – Continued

Security measures are all about protecting the system from being compromised by deliberate or accidental attacks. Processes need to be up and running without disturbance and in a way that does not endanger people or equipment. There are three important pillars for peace of mind in regard to cyber security.

Integrity
The system's functions and data must be protected from being modified by unauthorized persons or systems. For industrial control systems this especially relates to functions and data that directly or indirectly affect the process, such as control programs, product recipes, sensor values, or control commands. Loss of integrity of these can cause production loss and in worst case physical harm.
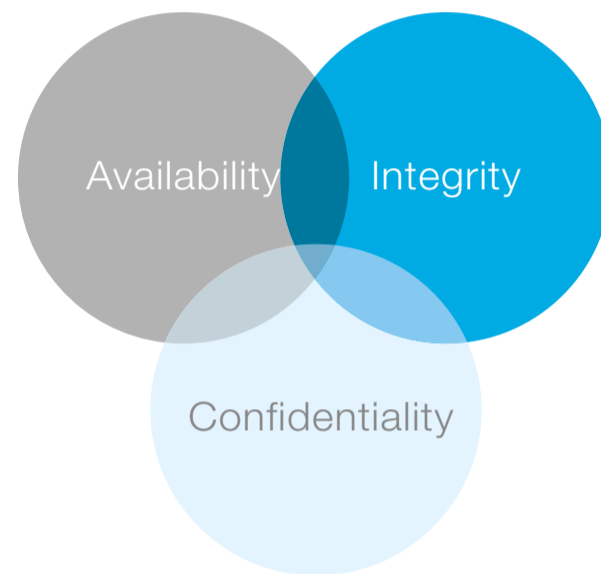
Availability
Unauthorized users must be prevented from denying legitimate access to or use of the system's functions, e.g. by overloading them or causing them to crash. For industrial control systems this particularly relates to functions that are directly or indirectly involved in the control of the process, such as controllers and field I/O, but also the operators' ability to monitor and control the process. Loss of availability of these functions may cause production loss and possibly also physical harm.

Confidentiality
Certain information needs to be protected from being disclosed to unauthorized persons or systems. For industrial control systems this mainly concerns information such as product recipes and plant performance and production data, which may represent valuable intellectual property and business assets. Loss of confidentiality for these types of information may cause significant financial losses. Also the secrets of the security mechanisms themselves, such as passwords and encryption keys, must be protected – if these are revealed the system is unprotected against many attacks.

Cyber security
Value proposition

The overall value of cyber security is peace of mind; everyone with a process control system should feel confident and secure. Key assets such as property, people and the environment need to be protected in an easy and efficient way.

Ensuring availability, reliability and interoperability

Effective cyber security ensures process continuity, i.e. no unexpected shutdowns or incidents that could affect production. Open standards can be utilized without compromising system security. Through effective communication between people and equipment at all levels, productivity as well as quality increase. User authentication, access control and system protection functions help prevent unauthorized access as well as problems caused by mistakes.

Easy installation and maintenance

Cyber security is easy to apply. With pre-configured installation, program settings are done in a consistent and repeatable way. Functions and features that are not needed are disabled or not installed.

The automation system and all related security equipment need to be kept up to date with relevant software updates, including updates to operating systems, security-related software, automation system software, libraries, and applications. This is easily taken care of through efficient patch and service pack management.

Easy disaster recovery

Larger losses due to incidents are avoided through efficient disaster recovery. Total and selective backup and restores are possible through system administration features.

Cyber security
System 800xA Extended Automation
The power of integration

Peace of mind with System 800xA

ABB fully understands the importance of cyber security and its role in auto-mation systems. As a customer investing in new ABB technologies, you can rely on system solutions where reliability and security have the highest priority.

To help customers achieve this proactive strategy for their 800xA based systems, ABB has partnered with Industrial Defender to provide Automation Systems Manager (ASM), a single, unified platform for secu-rity, compliance, and change management activities across control system operations. By augmenting the 800xA capabilities, ASM offers a single pane of glass in which operations personnel gain visibility into their com-plete, heterogeneous, automation environment. Together ABB and Indus-trial Defender ensure the ability to sustain a secure 800xA system through a suite of technologies and services.

Optimal compliance

ABB recognizes the importance of cyber security standards and is an active member and driver of various industry initiatives, including active involvement within ISA and IEC. We are constantly developing and improv-ing products compliant with the latest cyber security standards.

Secure by design

Cyber security is embedded in ABB's product life cycle, and is an integral part of System 800xA. This means that cyber security is addressed at each stage of our product life cycle, from design and development to testing and commissioning, as well as to processes supporting products and systems in operation both now and in the future. Security is integrated in the quality management system. Formal threat analysis and threat modeling provide the basis for security requirements and design principles for the system. Security check points at project gates ensure that security objectives are met.

One key element of this process is our independent robustness test center (the ABB Device Security Assurance Center), where all our products are tested. This laboratory is run by dedicated personnel who are not part of the development team using several specialized security testing tools (e.g. Wurldtech's Achilles Satellite Unit, Mu Dynamics', Mu8000). The AC 800M PM865 controller is also tested and certified to level 1 by Wurldtech's Achilles Communications Certification Program.

Cyber security
System 800xA Extended Automation
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System 800xA security features are designed to meet regulatory require-
ments such as by FDA. User account management and authentication is
based on Windows® Domain Controller (or Windows® Workgroups for small
systems). Functions include user authentication, re- and double authenti-
cation, user log over, audit trail and electronic signatures. Access control
can be based on user, role, and location, and access rights can be set with
granularity down to single objects and properties.

Secure by default – cyber security made easy with System 800xA!
When using the system installer, 800xA is installed in a predefined way,
which makes the process easy and reliable, ensuring that settings are done
in a consistent and repeatable way. Functions and features that are not
needed are disabled or not installed, and Windows® Firewall is automati-
cally configured.

System 800xA gives control engineers a unique opportunity to manage
the access for each user. Access can be granted based parameters such
as who and where the user is, what the user wants to do and on which
Aspect Object.

Read more about security functions that by default are included in System
800xA in 'Solution Details'.

Secure in deployment
User documentation describes how to install and operate System 800xA in
a secure way. This includes recommendations on how to build secure sys-
tem architectures using security zones and defense in depth.

Security compliance project checklists make sure that all important steps
are taken during project execution to ensure a secure system deployment.

ABB recommends that a virus scanner is used on all System 800xA servers
and workplaces. McAfee VirusScan® Enterprise and Symantec Endpoint
Protection have been tested and qualified for this purpose and do not inter-
fere with the 800xA system's operation and performance.

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Antivirus software works with blacklisting of malicious code, i.e. it uses a list of known malware. An alternative approach to antivirus is application whitelisting software. Only a set of pre-approved and digitally protected applications are allowed to run. The application whitelisting software SE46 has been tested and qualified for use together with System 800xA.

If the worst thing happens
Several features of System 800xA assist in recovering from a system failure to ensure business continuity in all situations. System functions support backup and restore of configuration and application data. 3rd party software is supported used for image backups. User documentation describes recommended tools and procedures.

We will help you
ABB provides training on tools and methods for secure system deployment. ABB's service organization assists in deploying and maintaining systems.

Always up to date
For Automation Sentinel subscribers it is really easy to keep their systems up to date with the latest security updates and virus signature files.

ABB evaluates all security updates from Microsoft and other vendors of required third party software for System 800xA, and tests all relevant updates for compatibility. A bulletin with the validation status and a package with the validated Microsoft Security updates, the "ABB System 800xA Qualified Security Updates", are available for download from ABB for Automation Sentinel subscribers. This package includes approved Microsoft security updates and a tool that makes installation simple and straightforward.

Also updates for supported virus scanners, including virus definition files, are tested for compatibility with System 800xA to ensure compatibility that legitimate code is not wrongly classified as malware.

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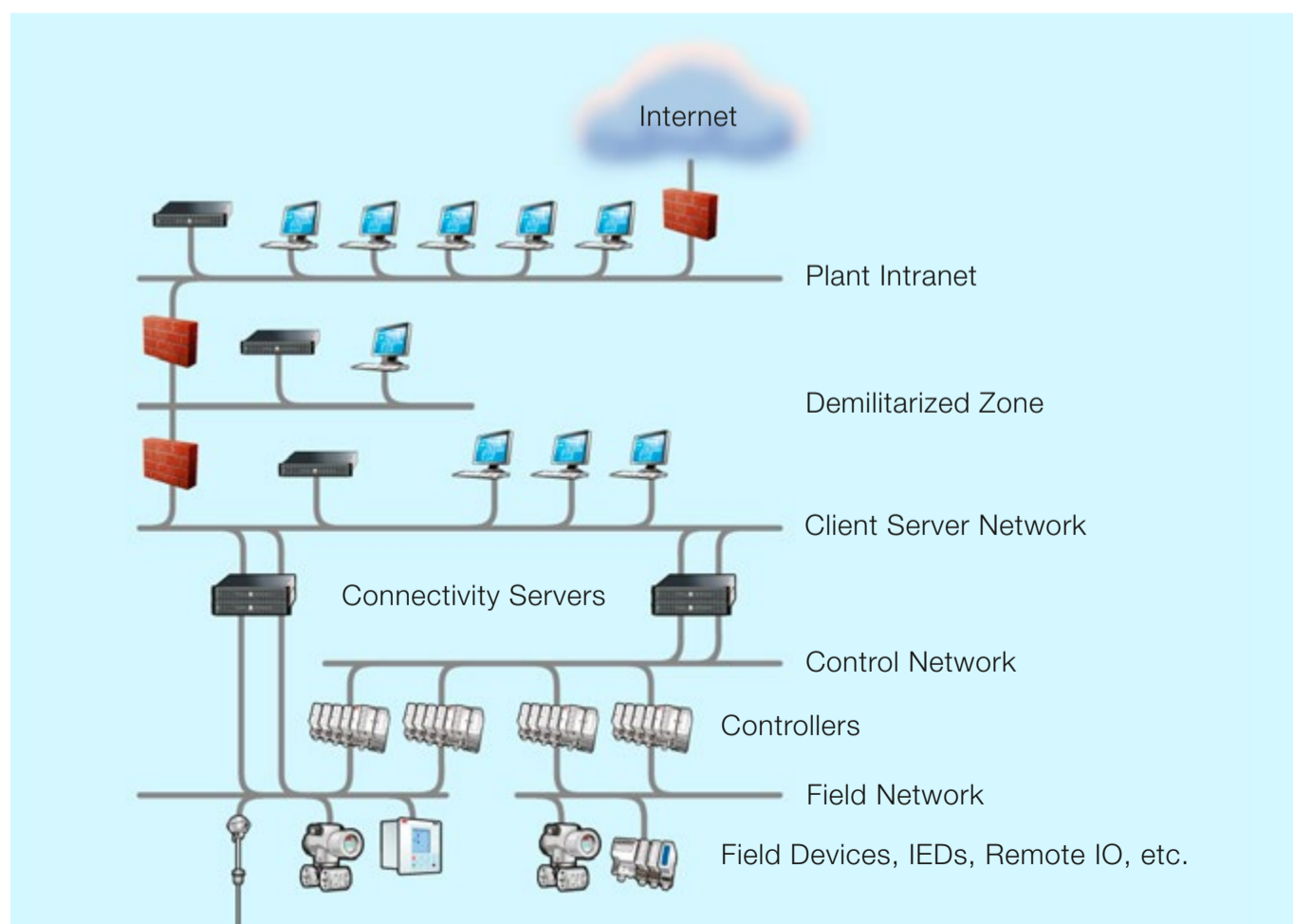
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Secure architecture

The system architecture is based on well established security principles such as Defense in Depth and Security Zones. The principle of Security Zones means segmenting a system into different zones for different security levels. IT resources vary in the extent to which they can be trusted not to be compromised. A common security architecture is therefore based on a layered approach that uses zones of trust to provide increasing levels of security according to increasing security needs. Each zone is inside the next, leading from the least trusted to the most trusted.

The principle of Defense in Depth means creating multiple independent and redundant prevention and detection measures. The security measures should be layered in multiple places and diversified. This reduces the risk that the system is compromised if one security measure fails or is circumvented.

Network segmentation with dedicated connection devices

The figure below show examples of the security zones achieved by using multiple separated networks only connected with dedicated connection devices acting as secure conduits between the zones.

Internet

Plant Intranet

Demilitarized Zone

Client Server Network

Connectivity Servers

Control Network

Controllers

Field Network

Field Devices, IEDs, Remote IO, etc.

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Firewalls separate the Plant Intranet, the Demilitarized Zone and the Client Server Network from each other. Connectivity Servers separate the Client Server Network, the Control Network and Field Network. Controllers separate the Control Network and the Field Networks.

RNRP Routers can be used to separate Control Networks for process control and safety. Firewalls in transparent mode can be used to enhance the separation achieved by Connectivity Servers and RNRP routers.

Demilitarized zone

The idea with a demilitarized zone (DMZ) is to increase security by avoiding direct connections between external systems and nodes on the 800xA system network. Instead, traffic to and from external systems is routed via nodes in the demilitarized zone. How this is done depends on the service that is to be accessed.

One example is that virus definitions and security updates can be loaded to a server in the demilitarized zone and fetched from that node from the system network. Another common usage of a demilitarized zone is as the location of VPN gateways for VPN connections terminated outside the Automation System Network. This usage is recommended for ABB's Remote Access Platform. An additional benefit with a demilitarized zone is that it allows for detection of an attack before it reaches the control system. By using two firewalls of different types the security of the demilitarized zone can be built even stronger. If there is a problem with the firewall on the outside of the demilitarized zone there is still a chance that this can be detected allowing actions to be taken before there is a problem also with the firewall on the inside.

Network protection with IPSec

IPSec (Internet Protocol Security) can be used to protect domain internal communication on the Client Server Network.

All system nodes use host-based firewalls

Clients and Servers use Windows® Firewall. This is automatically configured to the needs of each node by the System Installer. Controllers and their communication modules have a built-in dedicated firewall allowing only desired communication. This includes a storm filter that protects controllers from overload caused by network storms.

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User authentication and authorization

Functions for user authentication and access control in System 800xA are designed to meet requirements from regulated industries. User authentication is based on Windows® mechanisms. When the system is installed, default user groups with default permissions are created. These can be changed to fit the needs of any organization. Password policies can be configured, e.g. for minimum strength and maximum age.

The system can be configured to require **re-authentication** before accepting certain operations to ensure that they are performed by the logged-in person. Re-authentication results in an audit event, and thus also serves as an electronic signature for the operation. The system can be configured to require **double authentication** before accepting certain operations. Double authentication may be used for critical operations or when required by regulation. In this case also an additional person, one who has secondary authentication permission, must authenticate and thus approve the operation.

Re-authentication, double Authentication and log over result in audit events.

Log over enables a fast and temporary switch between logged-in users without breaking the context in the operator environment. It is primarily used to temporarily hand over between different users in cases were a certain operation requires higher authority than that held by the current user. In such cases, a supervisor may temporarily assume the responsibility, allowing his or her authority to be temporarily applied, before reverting to the normal user.

Authority checking is done by comparing a user's granted permissions with those required to perform an operation. Permissions can be set globally for the whole plant, or for areas and subsections, or even on individual objects, to match every possible need. Also the location from where the user is working can be included in the authority settings.

The system can be configured to require that certain aspects, such as a configuration aspect, a report, or a control application, are signed by a user. This signature, digital signature, includes the identity of the signer, the date and time of the signing, and a cryptographic checksum of the signed aspect. Later, the signature can be used to check if the aspect has been manipulated – if it has, the signature is broken.

Evolution

When we hear the word evolution, most of us think about biological evolution. When thinking about this, we know that it is a necessity; the only alternative is stagnation and decline. The same principle applies for an industrial plant. It has to be maintained in order to work properly, but that's not enough. To survive global competition, plant efficiency and productivity has to increase, and as cost-efficiently as possible. Otherwise the plant will experience what biological evolution calls 'natural selection', i.e. it will be phased out.

Evolution
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Evolution belongs to the future
With ABB, evolution belongs to the future, not the past. We are committed to help you upgrade your DCS and PLC systems while minimizing your ongoing risk. We work by your side on a continuous basis, helping you choose the right path and the right pace to proceed. At our disposal is a broad spectrum of evolution products, tools and resources.

ABB's solution is evolution
Evolution is ABB's guiding lifecycle principle and is embedded within ABB's product offerings, policies, programs, and processes. Evolution allows you to achieve your business goals by both sustaining your automation system and extending it with new features and technologies.

ABB's lifecycle programs
We help you make more-informed decisions, better control lifecycle costs, remove budget uncertainty, and eliminate unplanned upsets and trips due to system interruption. ABB's Lifecycle Management policies fulfill these needs. They include:
– ABB Lifecycle Policy
– Core Control Commitment
– Product Lifecycle status and history
– System 800xA Software Support Policy
– Automation Sentinel

ABB offers a way forward for all of your DCS and PLC systems. You not only get what you already have, but also the tools you need to increase plant efficiency and productivity in order to secure the future.

Evolution
Definition

What is the problem today?

Industry leaders are looking to improve overall productivity from their installed system by getting more value from it, extending its useful life, and reducing maintenance costs while improving overall reliability. Obviously, industrial plants need to update their systems, but existing system installations face many modernization challenges, including:

- 24/7 production that can't tolerate downtime/outages
- Upgrades must be performed with no or minimum downtime
- System improvements must upgrade with maintenance budgets and not capital project funding (CAPEX)
- Significant investments have been made to develop intellectual assets such as control logic, graphics, reports, etc., and replacing these is no small task. Changes to an existing system must therefore be limited to the specific area of interest, mitigate risk, and protect the owner's investments in hardware, software, and, most importantly, intellectual property, while still providing value. Owners need to ensure maximum ROI for their automation systems.
- Many different systems of different vintages are supplied by different suppliers. A fragmented DCS and PLC layer is an obstacle for increased plant efficiency and productivity.

Evolution is the solution!

Evolution is ABB's strategy that allows end-users to both sustain and extend their systems with new automation solutions. It provides the highest protection of investments and lowest risk to production through incremental, step-wise upgrades.

ABB's evolution concept is an ongoing process without an end, and it applies to all automation systems:

- DCI, Harmony/INFI90, Freelance, Master, Melody/CP, MOD 300 and System 800xA
- TDC300, Eperion, Provox, DeltaV, Teleperm, WinCC, PCS7, Foxboroal/A
- Evolution is much more than 'migration', which is basically rip and replacing an existing system and putting another one in.

> "It is not the strongest … that survives… It is the one that is the most adaptable to change."
> – Charles Darwin

Evolution
Definition – Continued

What is evolution?

Evolution is ABB's guiding lifecycle principle and is embedded within ABB's product offerings, policies, programs, and processes.

– Product offerings: evolution is available at all levels of the system - operations, engineering, control and I/O, and applications such as history, batch, and plant-wide integration.
– Lifecycle policy: although products go through traditional lifecycle phases, the system remains current / state-of-the-art and is always Active.
– Product support programs: hardware and software support programs ensure systems are properly maintained and remain in operation.
– Lifecycle planning: an ongoing collaborative process between ABB and system owners to identify their business needs, goals, and priorities; results in short and long-term roadmaps for system enhancement and maintenance.

Only ABB, via its evolution program, addresses the complete automation system lifecycle. Other suppliers offer point solutions that ultimately result in 'rip and replace'.

Traditional system migration	ABB system evolution
Human system Interface for Operators means loss of standard ABB displays and critical system information (diagnostics). Use of third-party OPC servers not fit for mission-critical applications.	Robust connectivity and full integration with the control network, devices and system information. The look and feel for operations remains the same.
Replace I/O, re-terminate field wiring	I/O and field wiring remains the place
Re-engineering or translation of control applications	Minimal to no engineering required
New algorithms result in new process control behavior	Process control is the same
Create new control documentation	Documentation converted and enhanced
Done all at one time	Incremental / step-wise upgrades
Long commissioning and start-up periods (re-tuning of loops)	Minimal commissioning and start-up (no returning of loops required)
Results in:	Results in:
– Greater loss of production	– Minimal loss of production
– Increased risk	– Minimal risk
– Higher project costs	– Lower project costs
– Loss of intellectual assets	– Preservation of intellectual assets

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Return of Assets (ROA)

Evolution maximizes the plant owner's Return on Assets (ROA) and Return on the automation Investment (ROI) by incrementally adding new technology and features while preserving installed physical assets (wiring, terminations, etc.) and intellectual assets (control applications, control graphics, historical data and documentation).

Examples of the three key complimentary evolution value propositions:

Minimal loss in production

With evolution, production interruption is minimal. Consoles can be upgraded with little effect on the running production system. Controllers can be upgraded and the only downtime required is installation and switch-over – typically done in a single shift.

Protection of intellectual assets

Plant owners have a tremendous investment in their intellectual assets. Consider the time expended in the design, implementation, validation and ongoing tuning/refinement of the control application. Upgrading to the latest controller protects all this effort as the same logic executes in the new controller. By converting user graphics, workplace layout and navigation methods, we can preserve the look and feel of the operations. This reduces training and start-up time yet retains the ability to interact and maximize control.

Lower project costs

Upgrade projects could be long, complex, risky and expensive. By providing incremental upgrades and investment protection, most of these risk factors, time and re-engineering expenses are reduced or eliminated. And with Automation Sentinel programs, the licenses for System 800xA are discounted 100%, thereby eliminating the software license fees for the project.

Evolution
Support for life

ABB is committed to maximizing the usable life of plant-owner investments

This policy sets the gold standard in the automation market. No other supplier makes such a statement for all automation products to all end-users. This is key point: ABB is committed to maximizing the usable life of plant-owner investments. The ABB Lifecycle Policy makes the following commitments:

– ABB Automation System are designed for continuous evolution and never become obsolete; there is always a path forward.
– An underlying system product remains Active until its functional equivalent is available.
– A non-Active product is supported for a minimum of ten (10) years in the Classic and Limited phases.

Active:
Products actively marketed, sold, developed (enhanced) and manufactured.

Classic:
Hardware: products are newly manufactured
Software: original version of OS supported, security patches validated and business-critical maintenance provided
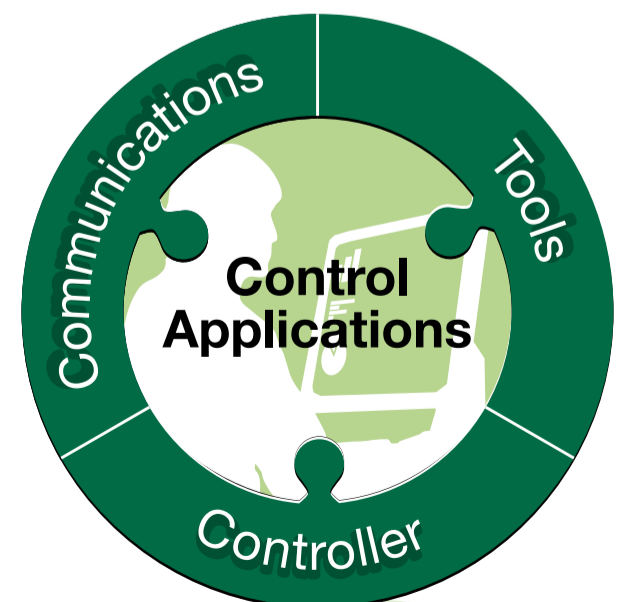
Limited:
Hardware: repair and refurbishing of modules
Software: best-effort support provided.

Core control commitment

This policy protects the end-user control applications and provides realistic time frames for lifecycle planning: products that directly affect these assets (control applications) will remain active at least until 2015 and then have the same standard minimum 10 year support. These core control products include controller hardware/software, the engineering tools used to configure applications

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Support for life – Continued

that run in the controllers, and the control network infrastructure. This commitment applies to DCI, Advant Master, MOD 300 and SATT. Harmony and Melody will remain active indefinitely.

Product lifecycle status and history

Product lifecycle status and history provides the information that empowers users to make intelligent business decisions regarding their ABB automation system. It is an essential element of lifecycle planning. ABB provides a product's current status, its lifecycle history and plan for the next 18-24 months.

System 800xA software support policy

This policy defines the support for both ABB software – System 800xA and its applications - and third-party components (hardware and software) that 800xA utilizes. It offers value by minimizing the disruption inherent with commercial off-the-shelf products (COTS) and providing flexibility in timing of software version upgrades.
– System 800xA software: System Versions (e.g. V 4.1 or V 5.1) will remain active for at least 18 months after the next version is released and System Versions will remain in 'classic' for at least 4 years.
– Third-party products: ABB will test previously qualified PCs with new system versions and newly qualified PCs.

Automation Sentinel

Automation Sentinel is ABB's control system lifecycle program. With this program, system owners can keep control software current and maintain a flexible path forward to new system revisions. Three levels of services are available, each designed to meet the varying needs of system owners:

Evolution is more than technology and policies. It is a way in which ABB engages with its customers throughout the system lifecycle.

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Three levels of services are available:

	Maintain and Evolve	Maintain Plus	Maintain
			Maintain the system at its current version level including
Evolution from OCS products to System 800xA software (new Software licenses)	✓		
New software versions and enhancements of installed products	✓	✓	
Evolution within the same (traditional) OCS system platform (new software licenses)	✓	✓	
Technical Phone Support (added to the contract by LBUs)	✓	✓	✓
Unlimited L3/4 Support for product issues	✓	✓	✓
Software Maintenance Updates and Corrections *	✓	✓	✓
System Maintenance Documentation	✓	✓	✓
Microsoft Security Update Test Reports *	✓	✓	✓
Ability to request ad-hoc corrections*	✓	✓	✓
800xA PC qualification reports*	✓	✓	✓
On-line access to maintenance items via SolutionsBank	✓	✓	✓

* for latest available software within a version in active and classic

Evolution
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Arkema St Auban evolves to System 800xA DCS family

Modernizing the control systems of its major manufacturing plants is helping the Arkema Group maintain its leading position in the speciality chemicals business. Evolving the installed Emerson Provox system at the company's St Auban PVC plant to ABB's System 800xA was thus an obvious route to take.

Technical and operational challenges

Arkema faced several specific problems that included obsolete Provox HMIs in the form of Provue consoles, difficulties with and high costs of repair of Provox keyboards, and three controller types (MUX, PCIU and DCU) that would soon be obsolete. At the start of the evolution, the system architecture included 5000 IOs.

Arkema also had other requirements. Existing equipment had to be used to make all connections and non-obsolete equipment was not to be replaced. Evolution also had to be done on-line to avoid production shutdowns. What's more, as a worldwide supplier of speciality chemicals, Arkema demanded global support from its third-party replacement supplier. All these needs fitted in with ABB's clear-cut evolution strategy.

The solution – step-by-step replacement using ABB:s vast evolution portfolio

In this case, ABB proposed a four-step evolution solution with System 800xA architecture:
– Replacing the first of the Provue consoles by a System 800xA HMI
– Implementing System 800xA Batch Manager
– Replacing the MUX, DCU and PCIU controllers with ABB's AC 800M
– Replacing the UOC controllers with AC 800M when needed (but not before)

The main tool used to achieve this solution is ABB's Connect to the Emerson Provox system. Connect provides connectivity for interfacing the existing Provox system with System 800xA architecture. Arkema now has a control environment for its present and future needs. The newly operational System 800xA meets the chemical group's requirement for secure, cost-effective production with increased capacity. It has great integration capabilities, is flexible, and has a state-of-the-art operator environment.

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Change of generation at Cheminova

Cheminova has been a major user of ABB process software since the mid-eighties and has long since learnt to appreciate ABB's Lifecycle Management Program.

In 2008, when the ABB operator system at Cheminova's P1 pesticide plant was changed to System 800xA, it had far exceeded its expected lifetime. The transition from the old to the new operator system went without the slightest disruption to production. Cheminova's senior engineer Karl Anders Kvist therefore views the future changes of generation that are to take place over the next 2-3 years at the other plants with confidence. The cost for the implementation of the new system is half that of the old one, and Karl Anders once again predicts a life of around 10 years for the new System 800xA. "By this we have now gone over to the Windows® platform," he adds.

Factories in the facility

Pesticide production is divided into 15 more or less separate factories, each with its own process specialities and operator rooms where 2-3 process operators control and monitor production and well over 2,000 signals. According to Karl Anders Kvist, a total of over 30,000 signals are controlled and monitored from different operator stations.

Practice makes perfect

"We have changed process systems many times before and we have now expertise in doing so quickly, and above all securely. The generation change we are undertaking in the next few years will be from Unix to Windows®, and among other things this means that we are compelled to update our 1-1 screens. The Windows® platform provides us with both better monitoring possibilities and several facilities which will benefit us greatly in the long term."

"Since we are now switching to Windows®, I expect that the changes we have to undergo in future will occur more often. Therefore we have entered ABB's program for current updates, which is called Automation Sentinel," says Karl Anders.

Evolution
Testimonials – Continued

Considerably easier

"I have been with Cheminova for 25 years, but I was trained as a process operator only three years ago. And I think it is considerably easier to navigate in System 800xA."

"The whole system is easier and more clearly laid out, and the new screens are far more convenient to work with and look at," says Martin Trillingsgaard Jensen, who also stresses the benefits of the trend curves. "Among other things, we have an overview image with links to the different corners of the system, which is a big help for new employees who are in a hurry to find the cause and location of an alarm, for example."

Documentation

The power of integration
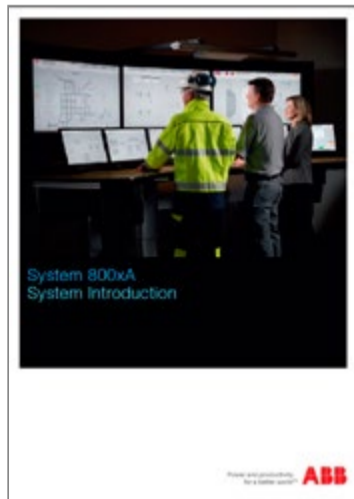
System 800xA
System Introduction

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800xA Set your operators
up for success
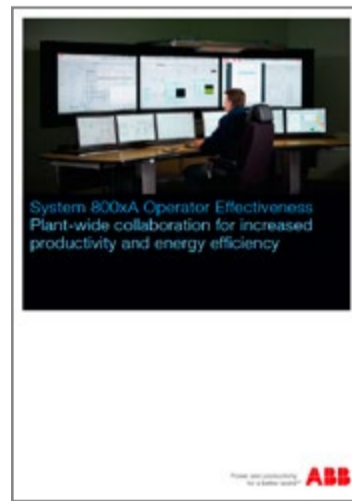
System 800xA Operator
Effectiveness Overview
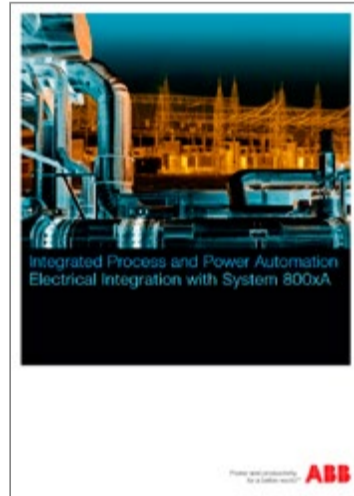

Guideline Operator workplace
and process graphics

System 800xA Extended Operator
Workplace EOW-x

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Automation and power integration

Integrated Process and Power Automation – Electrical Integration with System 800xA

Power up your Plant

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Integrated safety
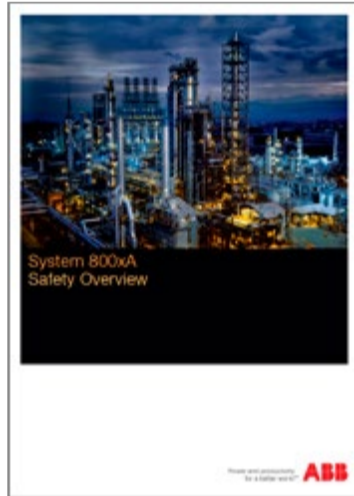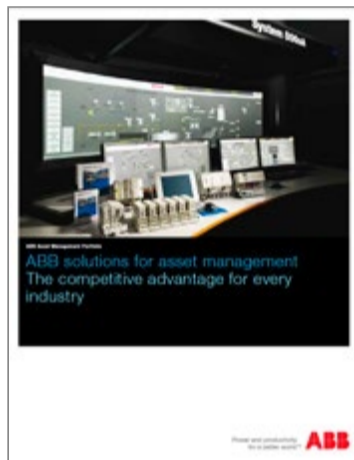
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Safety Overview
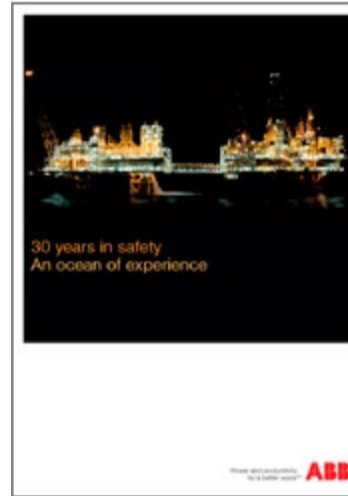
30 years in safety
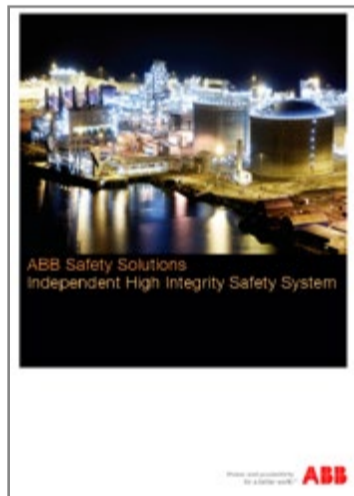
Independent High Integrity
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Evergreen Safety Solutions

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Enterprise asset management

System 800xA 5.1 Asset Optimization – ABB Solutions for Asset Management

Fieldbus technologies

System 800xA 5.1 Device Management Overview

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System 800xA Alarm management Overview

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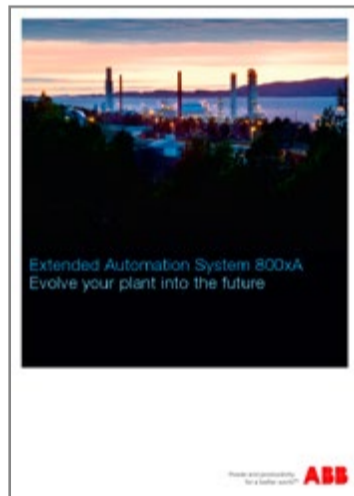Miscellaneous

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Cyber security

Security for Industrial Automation and Control Systems

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We want to hear from you! If you have any comments or suggestions concerning this document please don't hesitate to write or call your business contacts or directly to those listed below:

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