The customer newsletter of
ABB Power Generation

1 | 12

in control



Symphony Plus: in performance

Breaking performance records
Korea's largest thermal power plant
Symphony Plus in Singapore
Singapore's largest power generation company selects Symphony Plus
The evolution continues
Evolving and assessing Symphony Plus one year after launch
Advanced alarm management
Efficient and stringent alarm management with S+ Operations

Power and productivity
for a better world™

in control 1 | 12



Franz-Josef Mengede
Head of ABB Power Generation

Dear Reader,

With this issue of In Control we celebrate the first anniversary of the introduction of Symphony™ Plus, ABB's total plant automation platform for the power generation and water industries.

One year ago we unveiled the latest generation of the Symphony family. During the past 12 months, we have introduced the technology in all the regions and major markets of the world. We have also released several new functionalities and enhancements for all areas of the system.

The first year of Symphony Plus has been a big success. We have delivered Symphony Plus solutions that will control more than 8,000 MW of electrical generation. We are also executing several orders for system evolutions from earlier releases of the Symphony platform.

Two of the customers who are benefiting from these solutions have agreed to share their experience of Symphony and we are honored to feature interviews with Mr. Hwang Byoung-Hyun, section chief for plant operation at Korea Midland Power's 4,000 MW Boryeong power plant in South Korea, and with Mr. Lim Leong Chuan, head of instrumentation and control at Senoko Energy's Senoko Power Station in Singapore. Boryeong is the largest thermal power plant in South Korea, and Senoko among the biggest in Singapore.

You will also get to read about other ongoing or recently completed Symphony Plus projects for power and water installations in Europe, North America, Australia, and East and Southeast Asia.

We are delighted to announce the addition of several new control and I/O products to our rapidly expanding Symphony Plus portfolio. In line with our three decade long control system philosophy of 'evolution without obsolescence,' the latest products offer backward compatibility with previous generations of the Symphony family. Meanwhile, we remain committed to meeting the present and future control needs of our customers and to contributing to their competitiveness through performance, efficiency and total plant automation.

We hope you enjoy this issue of In Control and we look forward to hearing your views on any of the featured articles. Happy reading!

Sincere regards,



Franz-Josef Mengede
Head of ABB Power Generation



10 **Singapore's Senoko Energy selects Symphony Plus**



12 **Avedøre 1, Denmark**

Application focus

4 **Symphony Plus: The evolution continues**
We assess the progress made since launch and announce a batch of exciting new products

6 **Symphony Plus: Defining great performance**
Overview: Total plant automation for the power generation and water industries

Customer interviews

8 **Record breakers!**
Interview with Korea Midland Power Co

10 **Senoko Energy selects S+ Operations**
Interview with Senoko Energy, Singapore

Projects

12 **Case studies**
A selection of Symphony case studies

Service

19 **System evolution**
Reducing control system life cycle costs and risk through system evolution

Technology and innovation

22 **Alarm management for power generation**
S+ Operations provides efficient and stringent alarm management

Acquisitions

24 **ABB completes the acquisition of Powercorp**

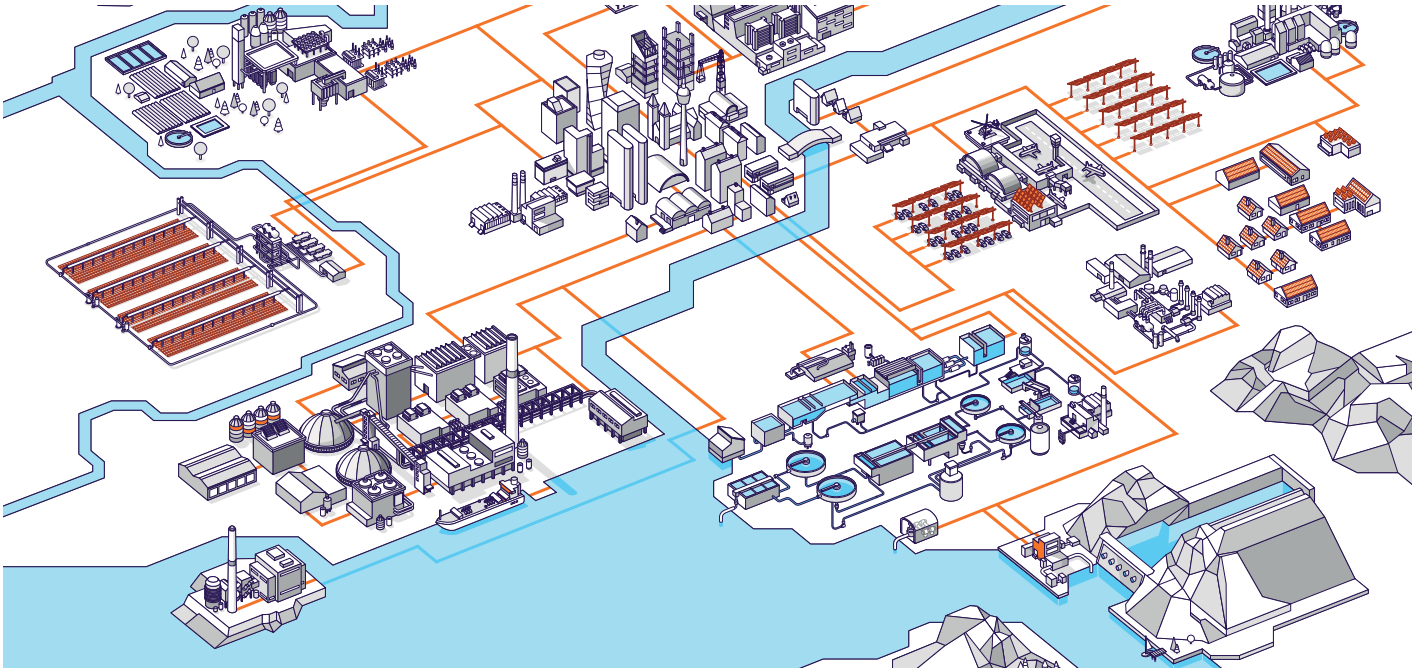
25 **ABB invests in water network monitoring company TaKaDu**

Product news

26 **Combustion instruments**
ABB adds new functionality to a powerful new family of flame scanners

Symphony Plus: The evolution continues

Twelve months ago ABB unveiled Symphony Plus at Automation and Power World 2011 in Orlando, Florida. One year on we look back on the progress made, announce an exciting new range of control and I/O products, and look to what lies ahead.



Much has happened in the past year. The global introduction of Symphony™ Plus in April 2011 was followed by rollouts in all the regions and major markets of the world: the Americas, Europe, Asia, China, the Middle East and Africa, India, South Korea, Australia and many more. Most of these rollouts took place at high-profile industry trade fairs and conferences like Power-Gen, or at ABB's hugely popular regional Automation and Power World events. Over the course of these events, hundreds of installed base customers and thousands of representatives of the power generation and water industries attended the launch presentations and live demos.

The response of our customers and of the market in general has been overwhelmingly positive. New orders and upgrades have flowed in. Within the first 12 months, ABB has delivered or is delivering Symphony Plus total plant automation systems to control more than 8,000 MW of electrical generation. And the request for upgrades or expansions from existing installed base power and process customers has been equally impressive. Profiles of several of these Symphony Plus projects are presented in this issue of In Control.

On the product front, ABB has been very active. New functionalities and features are continuously under development to ensure that Symphony Plus delivers the best-fit automation system for the markets it serves. Over the past year, new product functionalities and enhancements have been introduced to all areas of the system – from electrical integration and alarm management to engineering efficiency and cyber security. And now, as Symphony Plus reaches the one-year anniversary of its introduction, we are excited to announce the addition of several new control and I/O products that are specifically designed to meet the present and future control needs of our customers.

Within the first 12 months, ABB has delivered or is delivering Symphony Plus total plant automation systems to control more than 8,000 MW of electrical generation. And the request for upgrades or expansions from existing installed base power and process customers has been equally impressive.

The Symphony Plus controller family grows

One of the strengths of the Symphony Plus portfolio is that it includes a comprehensive suite of standards-based control hardware and software that meets the requirements of total plant automation.

S+ Control HPC800 is the latest addition to the Symphony Plus controller family. It complements existing controller versions and is suitable for applications that require modular DIN rail packaging.

HPC800 features a high-performance, Fast Ethernet-based plant network that makes it particularly suitable for distributed control applications in modern conventional and renewable power plants and water networks. Intelligent electrical and field device integration, as well as PROFIBUS and HART communication protocols, are also available with this controller.

All the Symphony Plus controllers, including BRC410 and HPC800, are flexible and secure, have a high-performance capability and include state-of-the art ABB control technology. They are interoperable with previous generations, and share control functionalities and technologies that are designed to protect the customer's investments over the plant's life time.

S+ Control HPC800 controller

S+ Control HPC800 is a high-performance, high-capacity process controller that supports the plant's total control requirements.

HPC800 features include:
- Simultaneous support of Harmony (and S+) Rack I/O, S800 I/O, S+ HART I/O, S+ Turbine I/O and intelligent field devices (MCCs, IEDs, flame scanners, etc)
- PROFIBUS DP, HART and Modbus TCP support
- Uses ABB's extensive set of field-proven standard function code algorithms and is configured by S+ Engineering Composer tool
- Downloadable firmware
- Extended user configuration memory (NVRAM) and runtime memory (RAM)
- Support for 30,000 function blocks
- Flexible and online configuration capability

S+ Control PDP800 PROFIBUS Interface module

S+ Control PDP800 PROFIBUS Interface module provides connection between the HPC800 controller and PROFIBUS DP communication channels. This allows for easy integration of intelligent devices such as smart transmitters, actuators and intelligent electronic devices (IEDs). Each device's resident information can then be used in control strategies and higher level applications.

PDP800 PROFIBUS interface features include:
- Supports PROFIBUS DP V0, V1, V2
- Supports PROFIBUS PA devices through DP/PA linking device
- Supports 1 msec time stamping of devices by PROFIBUS DP V2
- Supports electric and fiber optic media for PROFIBUS DP link
- Up to 12 Mbps rate of PROFIBUS DP link
- Up to 15 km by fiber optic PROBUS DP link

S+ I/O HAI805 and HAO805 HART modules

S+ I/O HAI805 and HAO805 HART modules provide connection between the HPC800 controller and intelligent devices using the HART communication protocol. Unlike traditional HART I/O modules, these HAI805 and HAO805 modules have dedicated HART modems for each I/O channel. This allows for better signal isolation and faster processing, and it makes the secondary, tertiary and quaternary digital variables available for use in real-time control applications within the HPC800.

HAI805 and HAO805 features include:
- HAI805 (8 analog input channels)
- HAO805 (8 analog output channels)
- Dedicated HART modem for each I/O channel
- Each channel's secondary/tertiary/quaternary variables are available for use in control applications
- Update rate of secondary/tertiary/quaternary variables for all channels is less than 1 second

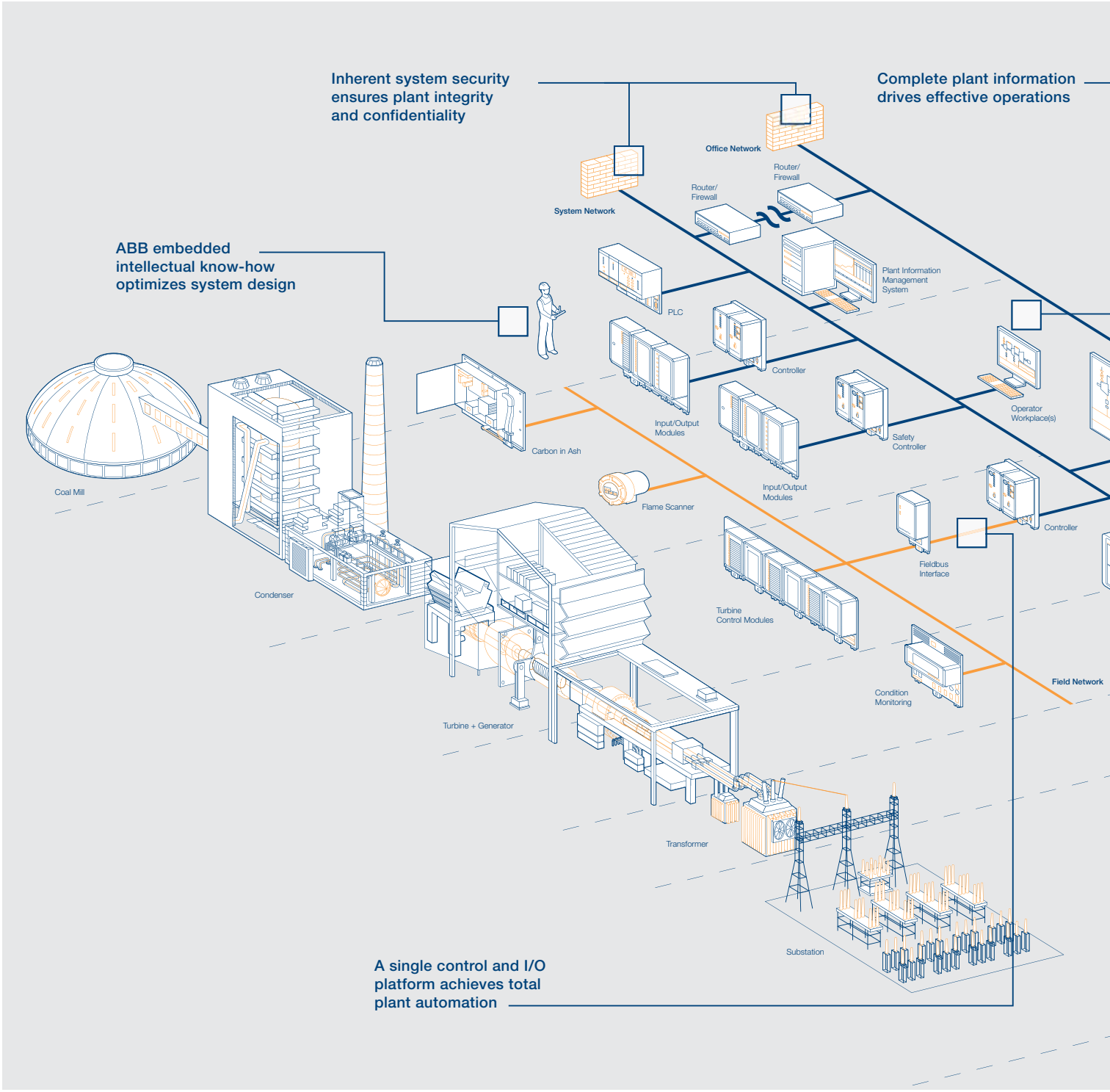
Based on field-proven technology

The HPC800 controller uses ABB's set of best-in-class control technologies to build its automation solutions. This allows end customers and EPCs alike to effectively reuse their extensive library of ABB field-proven and time-tested control solutions with these latest control products. Specifically, HPC800 solutions:
– Use the same extensive set of field-proven INFI 90 function code algorithms as in our large installed base of controllers
– Use traditional INFI-Net exception reporting over redundant 100 Mbps Fast-Ethernet (PN800)
– Extend current Composer graphical design engineering tools with device management capabilities

In summary, HPC800 control-based solutions provide increased flexibility and best-fit automation for all power and water applications. They reduce system installation and maintenance costs and preserve the customer's investments through their backward compatibility with previous generations.

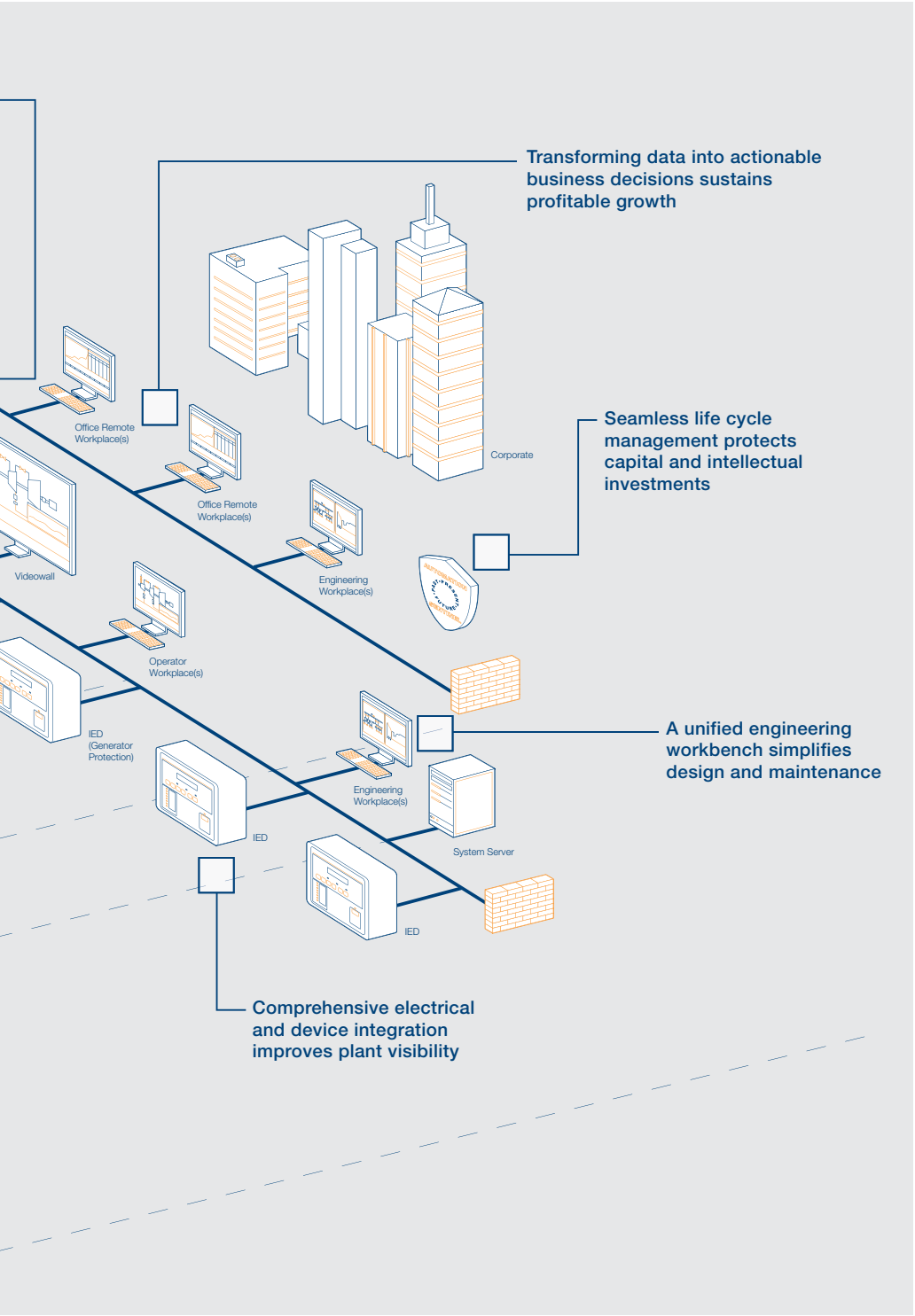
Many more Symphony Plus products and upgrades are in the pipeline. Forthcoming releases include AC 870P controller enhancements, which will provide upgrade support for existing CMC-50 controller installations; and IEC 61850 connect options, which will further expand S+ Operations 'single window to plant operations.'

Each of these new products and enhancements is confirmation of ABB's commitment to its installed base and to meeting the current and future automation system requirements of its customers.



Defining great performance

Symphony™ Plus is the new generation of ABB's widely acclaimed Symphony family of distributed control systems – the world's most widely used DCS in the power generation and water industries.



No other automation platform has such a long field record and large installed base in power and water applications as Symphony. For more than 30 years, ABB has evolved the Symphony family, ensuring that each new generation enhances its predecessors and is backwardly compatible with them – all in accordance with ABB's long-held policy of 'Evolution without obsolescence.'

Symphony Plus opens a new era of total plant automation that is simple, scalable, seamless and secure.

Simple

Symphony Plus is easily adapted to meet the broad spectrum of plant configurations and applications in the power and water industries.

Scalable

Symphony Plus' unique system architecture provides flexible and scalable configurations, from the small and server-less to large multi-system, multi-server architectures.

Seamless

Symphony Plus enables the seamless integration of field devices, process and turbine automation systems, electrical and SCADA systems, and business and maintenance systems.

Secure

Symphony Plus provides users with a secure and reliable control environment with built-in security features that prevent unauthorized control system access.

In all, there are more than 6,000 Symphony DCS installations in operation all over the world, more than 4,000 of which are in power and water applications.

Record breakers!

ABB has delivered in record time a new Symphony plant automation system for a 500 MW supercritical unit at Korea's largest thermal power plant, enabling the unit to start production 11 days ahead of schedule.
The unit is one of four that plant owners Korea Midland Power Co (KOMIPO) have contracted ABB to modernize with Symphony. They include the renowned unit 3, which holds the world record for trouble-free operation without unscheduled downtime.

The solution is the first of four new plant automation systems that ABB is contracted to deliver for units 3-6 at the Boryeong Thermal Power Plant in South Korea. All four units have been operating since 1994 and were the first supercritical coal-fired units to be built in South Korea.

Boryeong is South Korea's largest thermal power plant. It produces 4,000 megawatts (MW) of electricity from eight coal-fired units, 1,800 MW of power from four combined cycle units, and around 7.5 MW from hydroelectric and photovoltaic solar power plants.

Units 3-6 each have a generating capacity of 500 MW and are renowned for their high levels of plant performance. Unit 3 holds the world record for running without unscheduled downtime – this currently stands at 4,500 consecutive days of trouble-free operation and is still ongoing.

To ensure that the four units will continue to operate at the same remarkable levels of reliability, KOMIPO selected ABB in early 2011 to replace the existing multivendor control systems with state-of-the-art Symphony™ plant automation systems.

Unit 6 was the first of the four systems to be modernized. ABB completed the project within just 59 days, enabling the plant to start producing power and generating revenues 11 days ahead of schedule.



Boryeong Thermal Power Plant, South Korea

Obsolete multivendor systems

ABB was responsible for removing the existing multivendor control systems and auxiliary monitoring systems for unit 6 and replacing them with a Symphony integrated control and monitoring system for the boiler, turbine, balance of plant, flue gas desulfurization system, and selective catalytic reduction system.

The Symphony solution handles some 17,000 I/O points. Huge amounts of logic had to be analyzed, converted into standard SAMA (Scientific Apparatus Makers Association) logic, and implemented in the Symphony DCS. The turbine control system includes triple redundant servo valve control.

ABB also remodeled and modernized the central control and electrical control rooms to provide a more ergonomic and productive operator environment to enhance operational performance, plant productivity and site safety.

Other customer benefits of the ABB solution include increased reliability for the turbine and boiler protection system, better operational flexibility thanks to the new state-of-the-art operator interface, improved diagnostics for plant availability, reduced maintenance costs, extended operating life of the unit, and the security of ABB's unique commitment to protecting the long-term investment of customers in the Symphony platform.

ABB is currently installing an identical Symphony solution for unit 5 at Boryeong, with units 3 and 4 to follow. The modernization project for all four units is scheduled for completion in mid-2013.

Interview with Korea Midland Power Co

To find out more about the Symphony solution for Boryeong Thermal Power Plant, In Control interviewed Mr. Hwang Byoung-Hyun, section chief for plant operation at Boryeong, with responsibility for the plant automation retrofits.

Please describe KOMIPO's power generation business activities in South Korea.

Korea Midland Power (KOMIPO) is one of South Korea's largest power generation companies. We operate five large power generation sites, which comprise a total of 51 units and have a combined generating capacity of 8,400 MW. Each site is fueled by coal. Several sites also have large combined cycle units fueled by liquefied natural gas. We also generate power from renewable sources – hydro, solar and wind. Beyond South Korea, KOMIPO is active in plant construction, operations and maintenance, consulting and training.

Please describe the power plant complex at Boryeong and its importance to South Korea's power supply.

Boryeong is the largest thermal power plant in Korea and the largest in the KOMIPO fleet. It has a total generating capacity of 5,800 MW and supplies 8 percent of the country's electric power. The site comprises eight 500 MW coal-fired units and 12 combined cycle units producing 1,800 MW. In addition there is a 7.5 MW hydropower plant and a small photovoltaic power plant at the site.

KOMIPO recently awarded ABB a contract to replace the control systems for four of the 500 MW coal-fired units (units 3-6). Why did KOMIPO need to replace the old systems and what features and benefits did you require from the new system?

The old systems were more than 15 years old, and were composed of various subsystems from a number of different suppliers – boiler control from Sulzer and AEG, turbine control from GE, balance of plant control from Westinghouse, and so on. Some of these systems were obsolete. This made it difficult for the operators and maintenance engineers to keep the plant in good shape. With so many systems to operate and maintain, training was also a problem. To secure another 12-15 years of reliable operation, we required a new distributed control system for each unit that would control all unit operations and meet our very high requirements for reliability.

Why did KOMIPO choose ABB and the Symphony control system for this project?

ABB is a leading company in the DCS market and the Symphony family is a proven system, as the installed base data clearly shows. ABB's power plant DCS market share in Korea is very high – around 55 percent, excluding nuclear. The reasonable price that ABB quoted was key to their selection in an open bidding process. When I was informed that ABB had been selected as the DCS supplier, I felt comfortable and confident that the retrofit would be completed successfully.

Is there anything about the solution that particularly impresses you?

I am impressed by the performance of the Symphony integrated control and monitoring system. It is a huge improvement on the mix of other systems that we were using, which were causing us difficulties. Unit 6 is the first thermal power plant in Korea with such a unified distributed control system. ABB produced a good result and displayed a mature engineering capability within a short and challenging delivery time.

Did ABB's execution of the project proceed satisfactorily?

The project was a rare case of great success – thanks to an exhaustive pre-verification process, training and, most importantly, tight cooperation between KOMIPO and ABB. I am sure that ABB has also learnt a lot from this project. It was a win-win project for both companies.



The Symphony control room, Boryeong



Senoko Power Station, Singapore

Senoko Energy selects S+ Operations

When Senoko Energy, Singapore's largest power generation company, needed to upgrade the control system for units 3, 4 and 5 of its combined cycle power plant in Singapore, they chose S+ Operations, ABB's state-of-the-art human machine interface for a secure and reliable operations environment.

Senoko Energy produces close to one-third of Singapore's electricity from two power plants on the north and south sides of Singapore Island.

By far the largest of the two plants is the Senoko Power Station, which comprises seven combined cycle units and two thermoelectric units. Units 3-5 at Senoko Power Station have a generating capacity of 1,095 MW. They were converted from smaller oil-fired units in 2005.

Senoko Energy recently selected ABB to upgrade the control system for units 3, 4 and 5 to S+ Operations, ABB's intuitive and easy-to-use HMI for Symphony™ Plus. Senoko required a dedicated DCS historian for long-term data archiving to enhance plant integrity and confidentiality and provide inherent system security.

After looking at the rich features of S+ Operations and evaluating the alternatives, Senoko selected S+ Operations as the ideal HMI upgrade solution.

Stepwise evolution

ABB's stepwise evolution approach provides Senoko Energy with the flexibility to improve plant operations over time while maintaining its investment in human knowledge and in the existing DCS. Compared to rip-and-replace alternatives, S+ Operations was the lowest cost and lowest risk option for Senoko Energy to extend the operating life and attain the highest efficiency of its control system assets.

ABB will upgrade all the critical hardware and software components of the existing Symphony control system and perform the upgrade online without any interruption to plant operations. To ensure a risk-free transition, S+ Operations will operate in parallel with the Process Portal B consoles throughout the upgrade process. The upgrade is scheduled for completion in July 2013.

The benefits for Senoko Energy in evolving their existing Symphony HMI to S+ Operations are extensive and include:

- Upgrade of all critical hardware and software in accordance with ABB's unique and long-term life cycle policy of 'Evolution without obsolescence'
- Improved system reliability and cyber protection thanks to the inherent security features in all core functional areas of Symphony Plus, including S+ Operations, to protect the integrity and reliability of system operations
- Extended operating life of the ABB control system
- No plant shutdown during system upgrade activities

Interview with Senoko Energy

Interview with Mr. Lim Leong Chuan, head of instrumentation and control at Senoko Power Station, Singapore.

Senoko recently awarded ABB a contract to evolve the human machine interface (HMI) for units 3, 4 and 5. Why did Senoko need to evolve the old HMI and what features and benefits did you require the new control HMI platform to have?

Our present HMI is PC-based and operates on an earlier version of Process Portal. As the existing HMI is in the obsolete phase of its product life cycle, it is prudent for Senoko Energy to upgrade it to ensure that our base load generating units (3, 4 and 5) are operating reliably and efficiently.

S+ Operations is an optimal option for Senoko Energy as the upgrade work can be done progressively and without any interruption. The enhanced functionality enables the operators to seamlessly cross-navigate between operation displays and engineering documents. This feature will enhance their skillset tremendously when troubleshooting the controls and process of the water steam cycle, heat recovery steam generator and balance of plant.

Why did Senoko choose ABB and the S+ Operations HMI for this project?

With Symphony Plus, no alteration on the network architecture is required. The existing system hardware can be reused and the new S+ Operations HMI can be run in parallel with the existing one. This will enable the operators to acclimatize during the process of system evolution. The time required for upgrading work will also be reduced significantly.

What operational benefits do you expect the ABB solution to deliver?

The enhanced features of Symphony Plus will definitely be a plus for the operators. S+ will enable them to drill down further into the process and pinpoint the root cause of a deficiency and take the necessary action to improve plant performance. This know-how will enable the operators to make prompt and decisive decisions to prevent plant outages. In adverse plant conditions, the additional features of S+ will provide more plant information that will assist the operators to gradually and safely reduce the load on the affected unit and prevent significant additional equivalent operating hours (EOH) of the gas turbine due to a forced outage or PLST (protective load shedding trip).

One of Senoko's requirements was that the S+ solution should improve plant integrity and system security from viruses and cyber infiltration. Can you explain in more detail your requirements and how Symphony Plus will meet these requirements?

There has recently been an increase in cyber security incidents relating to power plant control systems. We have all heard of the case in Iran a couple of years ago. The Symphony Plus upgrade will encompass hardened system configurations to protect the system from infiltration. Anti-virus software will also be included as part of a concerted effort to harness the existing network architecture and provide effective in-depth defense for the control systems.

> "S+ will enable operators to drill down further into the process and pinpoint the root cause of a deficiency and take the necessary action to improve plant performance."

Are there any other functionalities and requirements that were important for Senoko when choosing Symphony Plus?

By choosing S+ Operations, we can leverage our existing control system network architecture to reduce the cost of the upgrade by only replacing the obsolete parts instead of the entire system. The time it takes to perform the upgrade will also be reduced significantly.

ABB also provides Senoko with service of the control systems for units 3-5. Can you describe the service contract and what the benefits for Senoko are?

Apart from the ABB Advant DCS for the gas turbines for units 3, 4 and 5, we have ABB Bailey N90 control systems installed at our two thermoelectric generating sets. Although we have sufficient skills to manage the daily maintenance of the systems, the proximity of the ABB service team is an important aspect of the service contract. Specialists can be called upon for technical support, and we know they will respond effectively.

What is your experience of working with ABB?

We have a cordial experience of working with ABB to date.



Avedøre 1, Denmark

Modernizing a super-efficient CHP plant

ABB supplies a new control system for the Danish power plant Avedøre 1.

Since its commissioning 22 years ago, the combined heat and power plant (CHP) Avedøre 1, located to the south of the country's capital Copenhagen, has been reliably automated with ABB Contronic 3/Procontrol 13 control systems. To further increase the efficiency and performance of the CHP plant this technology is now being replaced by the current ABB Symphony™ Plus system with AC 870P controllers. The main part of the automation system will be supplied at the end of March 2012, and the power plant is scheduled to go back on grid this year. The customer is DONG Energy, Denmark's largest utility.

The power plant consists of two units, which produce both electricity and district heating for the city of Copenhagen using mainly coal and to some extent oil as primary energy. Avedøre 1 produces 250 MW of power without district heating, and 215 MW of power plus 330 MJ/s of heat in combined operation. The plant originally used the Contronic 3 system for boiler automation and the Procontrol 13 (Turbotrol 5) system for turbine automation. With the new concept, both boiler and turbine will be automated with the ABB Symphony Plus control system using AC 870P controllers. This harmonization provides significant advantages in the areas of operation, maintenance and spare parts inventory. In addition, the operator control system S+ Operations will be used in combination with AC 870P.

The combined generation of power and heat places high demands on the control technology which the new system is ideally suited to fulfil. In the course of the modernization of Avedøre 1, the existing Contronic technology will be completely removed from the control cabinets and replaced by the new system and extended by control technology for the auxiliary equipment and connections to third-party systems. The field cabling will remain so that the connecting cables for the field instrumentation can be reused. As the installation and connection of the new control system are perfectly adapted to the existing plant, the modification and testing effort can be considerably reduced. This well-defined interface between 'old' and 'new' convinced the customer DONG Energy of the technical concept developed by ABB. The reuse of the existing cabinets including the voltage supply allowed the modernization costs to be significantly reduced.

Symphony Plus evolution improves supercritical reliability

Mailiao Power Corporation, Taiwan's largest independent power producer, selected ABB to improve the reliability of two supercritical units at the 4,200 MW Mailiao power plant in Taiwan. ABB evolved the existing distributed control systems to Symphony™ Plus, completing the entire project within a short delivery schedule.



Mailiao power plant, Taiwan

Mailiao Power Corporation (MPC) owns and operates the Mailiao supercritical coal-fired power plant on the western coast of Taiwan. The plant comprises seven 600 MW pulverized coal-fired units, which were originally commissioned between 1999 and 2000. The electricity generated at the plant powers the nearby refineries and petrochemical plants of MPC's parent company, Formosa Petrochemical Corporation.

Plant reliability is a key requirement for MPC, not just to ensure grid compliance but to secure the reliable supply of power to the parent company's production facilities and refineries. To enhance reliability of two of the 600 MW units, MPC selected ABB to evolve the existing 12-year-old Advant MOD300 distributed control systems to Symphony Plus. ABB was given 60 days to complete the entire project on-site and achieve MPC's required levels of reliability.

The ABB solution controls more than 16,000 I/O and includes boiler control and boiler management. ABB was responsible for engineering, procurement, simulation, factory testing, site works and commissioning. In addition, ABB also provided a new Uvisor™ flame scanning system to improve combustion effectiveness and thermal efficiency.

Following ABB's successful completion of the project within the contracted 60 days, the units' distributed control systems have achieved the required improvements in reliability and performance. Operators can easily access more and better process information via state-of-the-art consoles and the powerful ABB Power Generation Information Management (PGIM) system.

Equipped with the latest S+ Engineering Composer tools, MPC's plant engineers and operators now have a single accurate source of system information and a single window into process automation, field device engineering and maintenance – thereby saving time and increasing the efficiency of troubleshooting and maintenance.

Steaming ahead in Indonesia

Symphony Plus total plant automation systems have been selected by boiler manufacturer PT Zug Industry to control three new coal-fired power plants for national electric utility PT PLN.



Manufacturing a boiler at PT Zug Industry

ABB has been awarded multiple contracts from PT Zug Industry to supply and install Symphony™ Plus control systems for three new coal-fired power plants in Indonesia. PT Zug, a local OEM manufacturer of boilers, has been appointed by PT PLN, the state-owned national electric utility, as the engineering, procurement and construction (EPC) contractor for the control and instrumentation package for all three power plants, for which they will supply the boilers for steam generation.

The three new coal-fired facilities are a 21 MW power plant at Sungai Ringin in West Kalimantan province, a 14 MW power plant at Kuala Tungkal in Jambi province, and a 14 MW power plant at Tapak Tuan in Aceh province.

ABB will be responsible for the complete system supply including design, engineering, project management, testing and supervision of the installation and commissioning of the Symphony Plus control systems. The solutions will provide full boiler protection and include burner management systems to ensure boiler furnace safety, especially during the potentially hazardous operating phases of start-up and low-load operations. The Symphony Plus DCS will communicate with the 20 kV distribution feeders through the IEC 61850 protocol. ABB will also provide a wide range of instrumentation to control the boilers, turbines, generators and plant auxiliaries, as well as integrated plant information management systems for plant diagnostics and optimization.

The construction of the power plants will help meet the increasing demand for electricity in the cities and surrounding areas in which the plants are located. The abundant availability of coal at each plant location will help reduce production costs and make the electricity more affordable. The projects are scheduled for completion by 2013.

ABB recently received another contract from PT Zug for the supply of a distributed control system and instrumentation for the 55 MW Benkayang coal-fired power plant in West Kalimantan province, which is also scheduled for completion in 2013.

Symphony Plus selected for new thermal power plant in India

ABB is providing a Symphony Plus total plant automation solution to maximize plant efficiency and reliability at a new 700 MW thermal power station in the northeast Indian state of Orissa.

ABB has been selected by Ind-Barath Energy (Utkal) Limited (IBUEL) to provide a Symphony™ Plus total plant automation system for the company's new 700 MW coal-based power plant in the Jharsuguda district of Orissa state in northeast India.

The plant is currently under construction and will comprise two 350 MW units, both of which are scheduled to start production towards the end of 2012. The main generating equipment consists of two steam turbine generator sets manufactured by Harbin Turbine Company, and two pulverized coal-fired reheat type boilers supplied by boiler manufacturer Cethar.

ABB is providing a Symphony Plus distributed control system and management information system (MIS) to maximize plant efficiency and reliability through the automation, integration and optimization of the entire plant.

The system will handle some 7,500 I/Os for each unit and 2,000 I/Os for the common system, including remote I/Os for cooling water, auxiliary cooling water, cooling towers and other plant components. The controls include burner management system, boiler controls, turbine auxiliaries control and electrical systems for each unit and common system.

S+ Operations

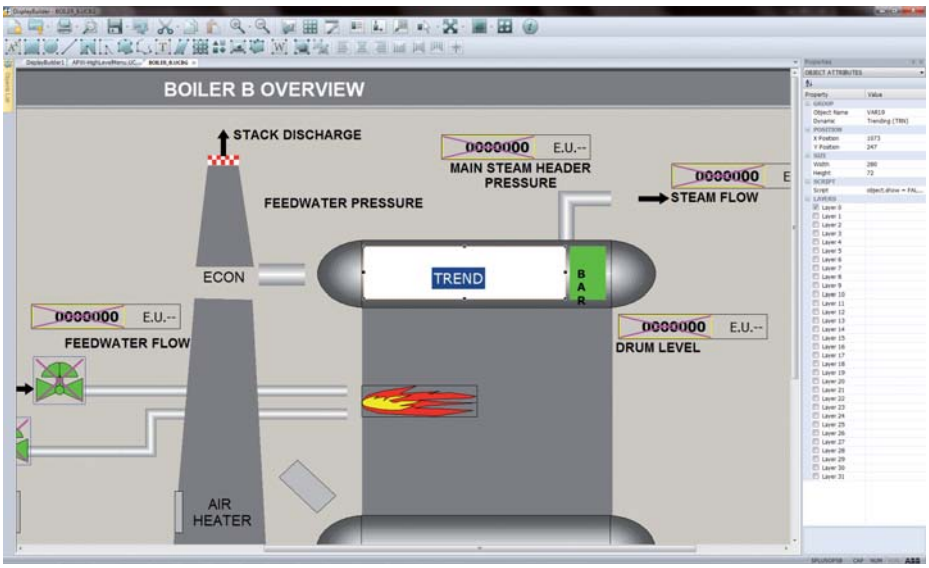
The solution will include S+ Operations, ABB's new human machine interface for Symphony Plus. S+ Operations is an intuitive and easy-to-use HMI that is designed to lead operators to greater awareness, faster response and better decisions. It seamlessly integrates all plant devices and systems, and provides operators with all plant and process information in a single environment using state-of-the-art graphics and information-rich control templates.

The control room will be equipped with seven operator work stations for each unit, as well as two Symphony Plus operator stations for the common systems and one station for the operations supervisor. The MIS Web server at the station level provides plant management with a window into the entire plant. All the off-site programmable logic controllers for the coal handling plant, ash handling plant and other parts of the off-site process communicate with the MIS server through OPC / Modbus TCP. The Symphony Plus BRC410 Controller Modbus TCP feature will be used for communication to actuators.

ABB was awarded the project after stiff competition from international and local suppliers. IBUEL preferred ABB's new Symphony Plus offering for its simple and flexible system architecture and its ability to support IBUEL's operations and business requirements - all backed up by ABB's vast global experience and local expertise in power plants.

IBUEL is a subsidiary of the Indian power generation company, Ind-Barath Power Infra Group, which operates a number of power plants in five Indian states.

S+ Display Builder



Symphony Plus for one of Australia's oldest power stations

Complete distributed control system retrofit for Hazelwood Power Station.



Hazelwood Power Station, Australia

ABB had been awarded a contract from International Power GDF SUEZ Hazelwood to retrofit the control system for Hazelwood Power Station, situated in the Latrobe Valley region of the State of Victoria, Australia, approximately 150 km east of Melbourne.

Hazelwood Power Station has a nominal capacity of 1,600 MW from eight generating units. ABB has earlier retrofitted and successfully commissioned a similar control system for units 1 and 2 at Hazelwood.

ABB will be responsible for the design, engineering, supply, installation and commissioning of the Symphony™ Plus control system for Hazelwood's units 3 and 4, which will provide automatic control for the boiler unit and alarm system.

Utilizing the cutting edge capability of the system, the solution will provide high capacity process controllers, advanced function code libraries for application programming, and automatic control loops that are optimized to strict tolerances. By providing precise control of the main plant parameters, the solution enables each unit to operate at a high level of efficiency, reliability and availability. Stress levels on critical components are also significantly lower, thereby extending equipment life and reducing maintenance and downtime.

Upon completion, the customer will benefit from improved asset availability, operational reliability and production efficiency to assist with Hazelwood's business goals, such as asset life extension, carbon dioxide reduction and regulatory compliance.

The overall project is scheduled for completion in 2013.

By providing precise control of the main plant parameters, the solution enables each unit to operate at a high level of efficiency, reliability and availability.

Improving plant efficiency and load scheduling

ABB has developed a solution that increases energy efficiency and improves load scheduling at five Enipower combined cycle cogeneration plants in Italy.



The control room at Enipower's 780 MW combined cycle cogeneration power plant at Ferrera Erbognone in northern Italy. The plant is equipped with an ABB Symphony Harmony plant automation system

The solution enables Enipower to improve its competitive strength in the energy trading market and meet ever-tighter regulatory requirements for reduced greenhouse gas emissions. The targets given ABB by Enipower were to improve the energy efficiency of the utility's combined cycle assets in Italy, while providing a significant payback in terms of reduced operating costs, improved profitability and lower carbon impact.

Comprising an integrated platform of two packages - one for real-time plant monitoring and the other for load capacity programming – the solution is installed at Enipower's five combined cycle cogeneration power plants in northern and southern Italy, as well at the company's corporate headquarters in Milan. The five plants have a combined generating capacity of around 3,900 MW. Typically, each plant comprises two or three units, each of which is equipped with a 260 MW gas turbine and a 120 MW steam turbine.

Integrated solution

The solution's online monitoring component monitors critical equipment in each unit, including the gas and steam turbines, heat recovery steam generator and condenser. It calculates the key performance indicators for each item of equipment and their deviation from the reference and optimal figures, taking into account factors that impact equipment performance such as steam export for cogeneration, fogging and anti-icing, aging, and so on. It also identifies the causes of the deviations and their remediation.

The load capacity programming component calculates the minimum and maximum power generation capability for all five plants, and estimates the gas consumption required and resultant average kilowatt-hour cost. It also conducts load forecasting over a time-span ranging from a few months to several years, and performs what-if analyses by evaluating variations in key performance indicators caused by changes in the weather and/or plant operating conditions.

The two integrated package components are based on proven ABB products: Power Generation Portal for real-time monitoring, and ABB SIMPRED for load management.

The solution has been in operation since mid-2010 and has successfully met Enipower's expectation of an efficiency improvement of up to 0.1 percent from the entire plant fleet and a significant return on investment, both financially and in terms of emissions reduction.

Upgrade in Honolulu

ABB is evolving to Symphony Plus the boiler control systems at Hawaiian Electric's oil-fired power plant in Honolulu, the capital and most populous city of the US state of Hawaii.



For more than 120 years, Hawaiian Electric Company has provided the energy that has fueled the development of the Hawaiian Islands from a kingdom to a modern US state. Hawaiian Electric Company, and its subsidiaries, Maui Electric Company, and Hawaii Electric Light Company, serve 95 percent of the state's 1.2 million residents on the islands of O`ahu, Maui, Hawai`i Island, Lana`i and Moloka`i.

It has been ABB's honor - through a partnership with Hawaiian Electric - to participate in the modernization of the power generation and power delivery infrastructure for the islands.

Each year, Hawaiian Electric participates in ABB's user conferences. During last year's Automation and Power World 2011, ABB confirmed its commitment to the Symphony™ family and launched Symphony Plus.

Because of ABB's commitment to Symphony and its focus on the power industry, Hawaiian Electric selected ABB for boiler control retrofit projects for units 8 and 9 at Honolulu Power Plant.

Evolution to Symphony Plus

Honolulu Power Plant has two 58 MW oil-fired units, which became operational in 1954 and 1957. Between 1980 and 2010 HECO executed various projects that included the installation of ABB Network 90 and INFI 90 control systems. To upgrade aging equipment, ABB was awarded contracts to evolve its installed base of Bailey / Symphony systems to a state-of-the-art Symphony Plus control system with which Hawaiian Electric can efficiently and reliably operate the two units.

The solution is based on the Symphony Plus platform and includes 14 S+ Operations HMI stations, a Composer Engineering station, Harmony controllers and S800 I/O, as well as motor control centers. ABB is providing the hardware, software, system engineering services, project management, installation engineering, factory acceptance testing, training, field service and final tuning of the units. A construction work package consisting of cable schedule, DCS termination drawings, instrument locations, schematic and wiring diagrams is also included.

Honolulu 9 will be completed in May 2012 and Honolulu 8 in October 2012.

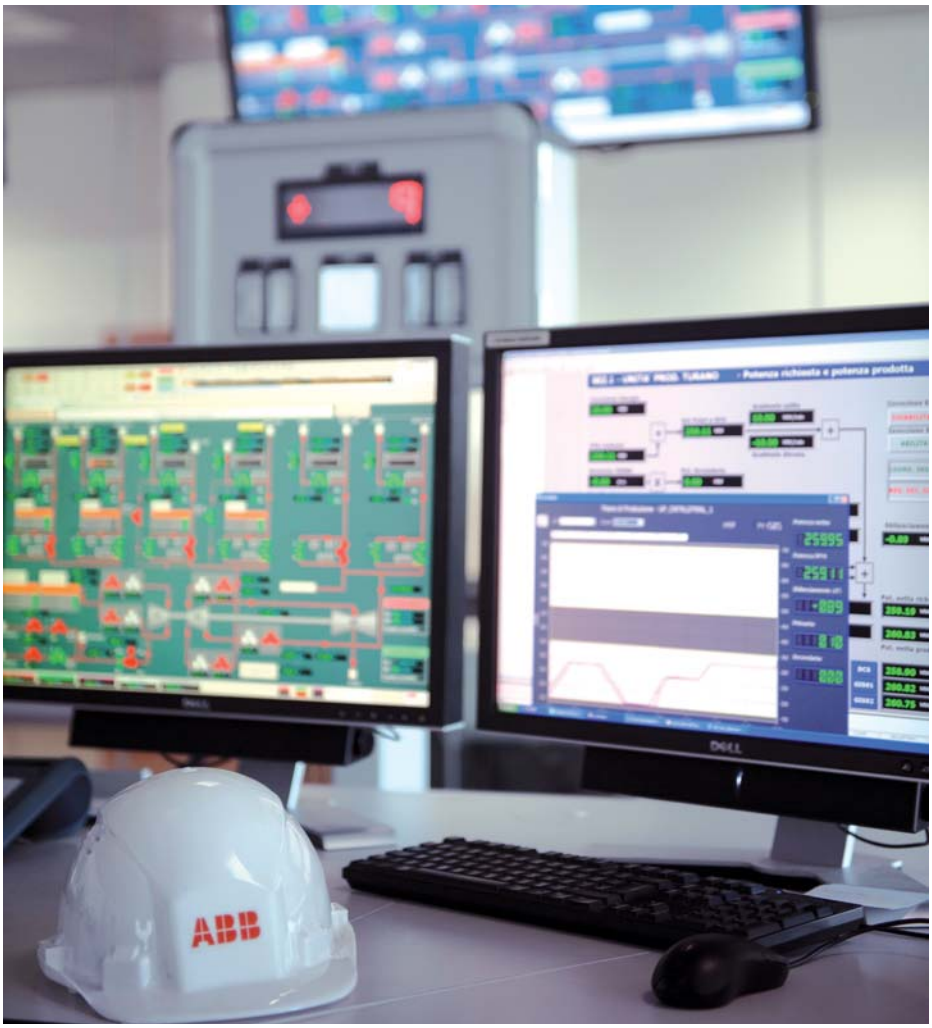
Hawaiian Electric also utilizes ABB Symphony control systems at its Kahe and Waiau power plants.

System evolution

Reducing control system life cycle costs and risk through system evolution.

ABB has a long-standing commitment to its control system owners that ensures future advances in system technologies will enhance rather than compromise their current system investments. For more than 25 years, ABB's evolution policies have allowed system owners to maximize the useful life of their control systems and the intellectual assets built upon them. Through stepwise evolution of their system solutions, the risk associated with system change is mitigated - minimizing process and system downtime and protecting the owner's long-term investments in control applications, process graphics and historical data.

Working side-by-side with all of our system owners and guided by the owner's business goals, ABB assists in the development of the evolution path and its pace. Regardless of whether the initial investment was made 1, 5, 10 or 15 years ago, the installed automation system is still a vital and sustainable part of the business and manufacturing strategy that can be enhanced and extended for years to come in a way that presents the lowest life cycle costs and lowest risk.



Four-point evolution strategy

Superior products are the cornerstone of ABB's evolution strategy. However, simply incorporating new products into an existing system will not ensure success or provide the desired results. ABB's evolution commitment consists of a four-point strategy that represents a comprehensive solution and provides a roadmap to successful system evolution. This four-point strategy includes:

1. Product planning process

ABB's system planning and development strategy is fundamental - new features and capabilities must be adapted seamlessly with minimum impact to existing applications. The development process involves rigid guidelines to ensure the compatibility of differing versions and models of system components. Each new step is a natural progression of the current system offering and never behaves like a plug-in or raw adaptation of someone else's product. For example, the application code runs as it did when first developed, and new controllers seamlessly coexist on the same control network as previous generation controllers.

In order to fulfill an individually tailored upgrade path, ABB system enhancements provide a unique blend of flexibility and scalability. The ability to mix and match hardware and software of different generations is a major strength. ABB has services and solutions that preserve the system owner's investments. This ensures the continued use of base control hardware infrastructure and protects the intellectual asset investment made in software applications. For example:

- Process graphics: Saves the time and expense of re-engineering and intensive user/operator retraining
- Database: History data preservation restores existing historical data and can be transferred directly to the new history platform
- Field wiring: Eliminates the need for field rewiring and reduces the time and cost of retesting when existing I/Os are replaced with a new I/O product
- Control applications: Preservation of field-proven control configurations and documentation minimizes production risk and project/engineering costs

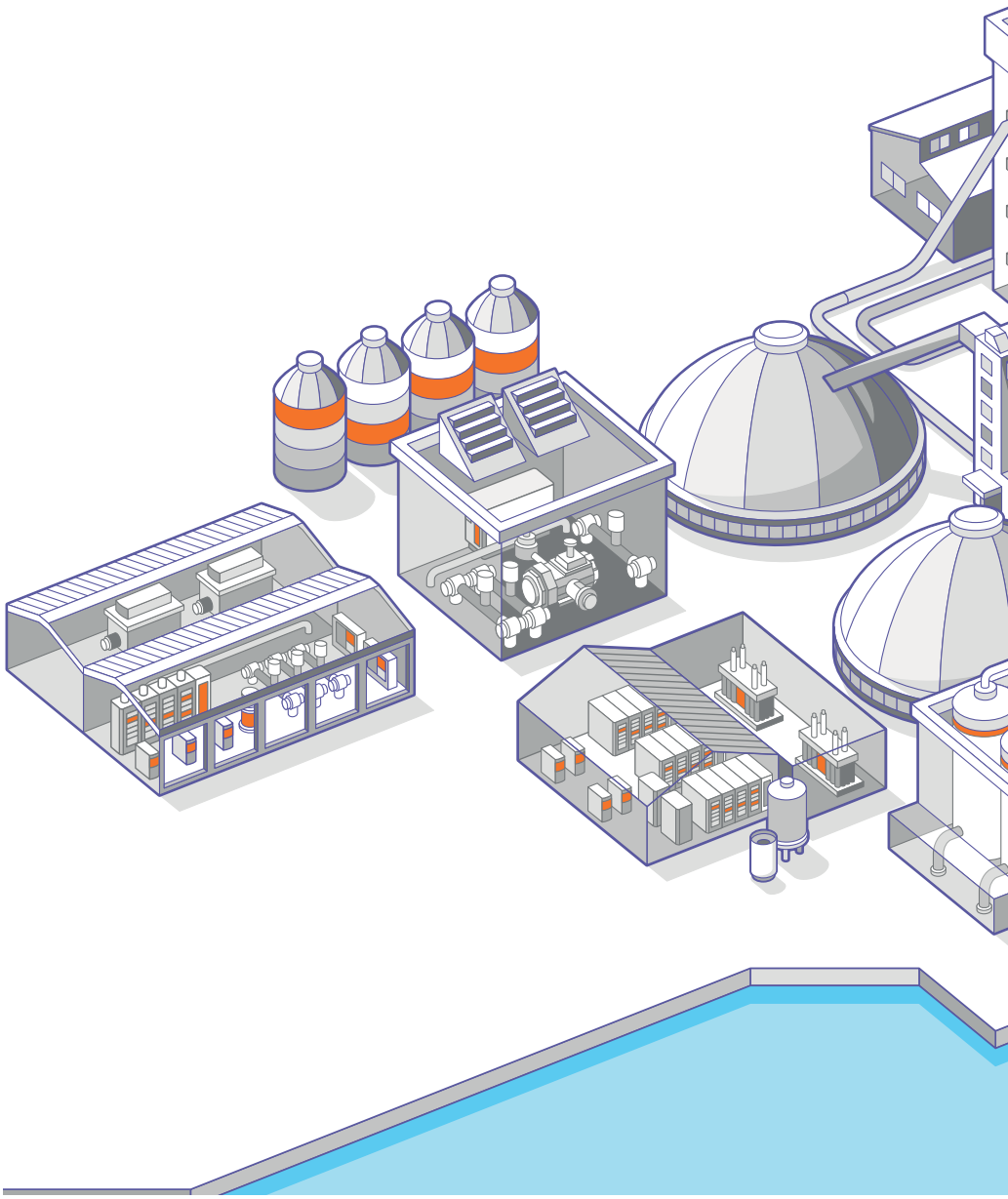
2. Customer evolution planning process

A successful evolution program begins with a solid plan driven by the owner's business goals. Good planning is critical for any incremental, stepwise evolution and can minimize the negative production impact of the actual upgrade process. It can simplify and improve the yearly budgeting process and facilitate better system upgrades and planned plant shutdowns.

Individualized planning is essential. Different industries invariably have different strategies and business issues going forward. At ABB, account managers and technical experts work with system owners individually to address their unique needs. The collaborative relationship results in the best strategies for each individual site.

After a comprehensive audit of the existing system, and with an understanding of the business drivers, ABB will:

– Submit a 3-5 year plan to be reviewed and revised as necessary. ABB's incremental approach supports flexibility, allowing for changes to the plan as required over time
– Identify and target which facilities are at the greatest risk for production loss and those that have the greatest potential for increased production. As each phase is identified, ABB will provide value assessments and return-on-investment support for consideration in order to facilitate successful project appropriation requests
– Review the long-term plan periodically; update as required to reflect changing business needs and new ABB solutions. This approach takes the guessing out of the budgeting process. As part of this planning process, specific projects are identified and implemented



3. Customer evolution programs

ABB promotes a proactive approach to hardware and software upgrades; working with system owners to stay current and avoid hitting the brick wall of obsolescence through stepwise, incremental upgrades. This philosophy allows system owners to continuously improve productivity as new technologies and automation product offerings become available.

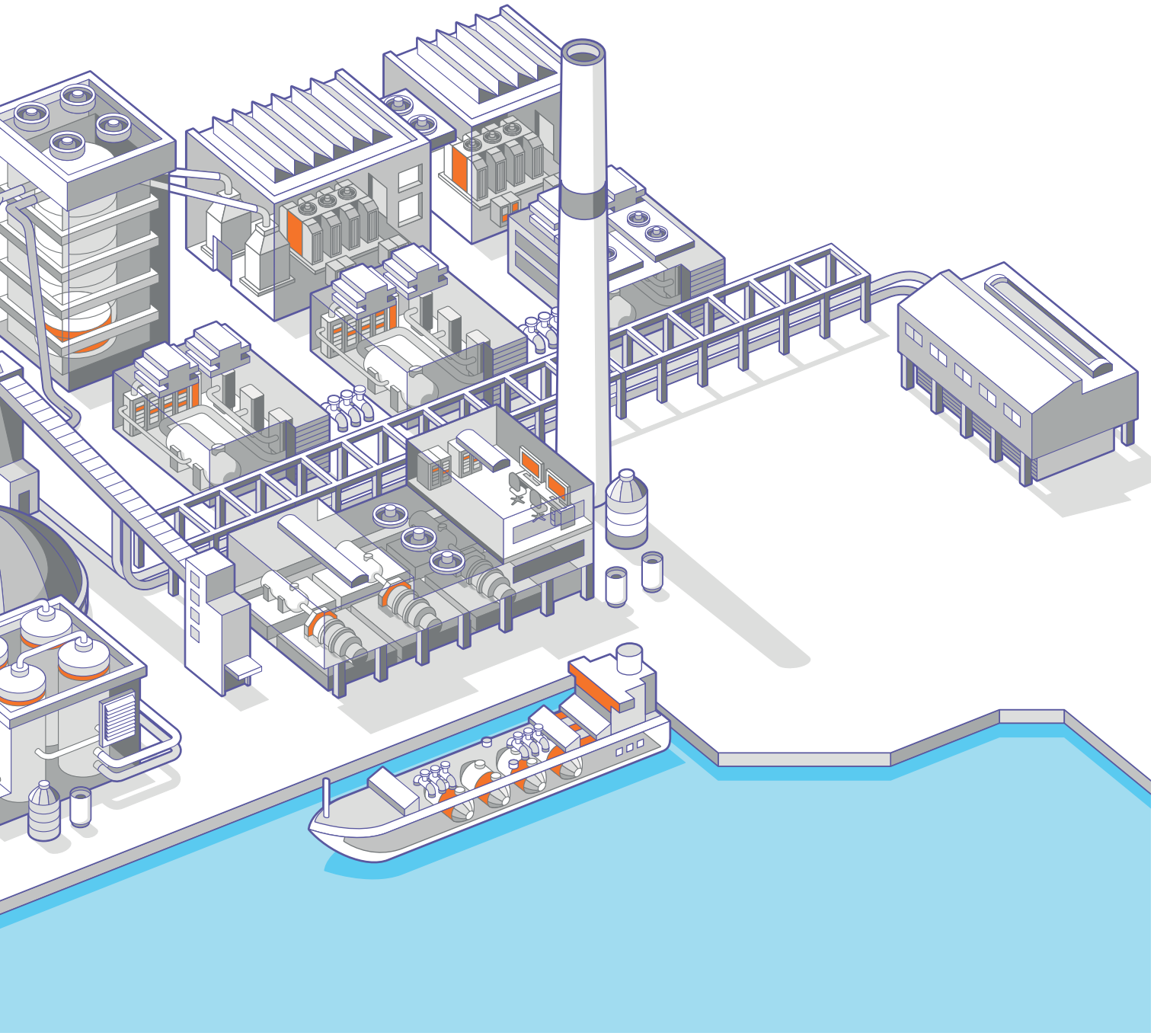
ABB evolution programs provide the financial flexibility to move from existing automation system products to new, higher performance human system interfaces, system engineering tools, controllers, control networks, and information management – one functional area at a time.

ABB's Automation Sentinel software management program assists system owners to actively manage their life cycle costs in ABB control system software. With this program, they can keep control software up-to-date and maintain a flexible path forward to new system software technology. Automation Sentinel helps manage software assets with timely delivery of the latest software releases, thus providing subscribers with:

– Better productivity through enhanced software functionality
– Lower support costs and simpler software management through known annual subscription fees
– A way to stay current with the latest industry and IT standards
– Access to the most current system documentation
– Evolution to higher levels of human system interface, control, information management and connectivity

4. Solutions delivery

Delivery of sound system solutions based on evolution plans is another important process in the evolution value chain. ABB's system engineers are highly trained, skilled and equipped with



the tools and resources to do the job right. These ABB resources know what is installed, know what is needed to meet future goals, and have the knowledge to deliver it.

The project begins with a comprehensive review of the requirements formulated in the long-term plan. ABB engineers work closely with the system owner to formulate a project plan that achieves the desired end results. Based on this collaborative effort, the engineers design a solution that delivers results, protects system investments, and presents the lowest risk possible during installation.

Alarm management for power generation

S+ Operations' advanced alarm management provides all the necessary instruments for efficient and stringent alarm management.

A fast-changing environment requires plant flexibility

Wind power and other renewable energy sources are increasingly complementing the 'classical' power plant mix. The new energy sources may be environmentally friendly, but they also account for a more volatile energy production. Wind and solar power are not easy to control, and the increasing volumes of renewables in the energy mix call for more flexibility from all types of power plants.

These requirements, combined with the constant striving for increased efficiency, demand higher levels of control and new operating skills. A high-quality alarm system is an essential operator tool for running a plant safely and efficiently.

In many plants, however, modern devices and systems generate alarms too easily, leading to permanently high alarm rates. Alarm rates that are consistently too high distract the operator, decrease operator vigilance and awareness, and overload the operator's short-term memory – thus compromising his ability to react timely and adequately.

ABB's alarm management vision

ABB has a long-term involvement and strong commitment to standards like EEMUA 191 and ISA SP 18.2. In combination with our in-depth knowledge of all types of power plants, this commitment has resulted in the following vision for alarm management:

- Each alarm should alert, inform and guide
- Alarms should be presented at a rate that operators can deal with
- Detectable problems should be alarmed as early as possible
- Cost/benefit of alarm engineering should be reasonable

S+ Operations incorporates ABB's latest technologies to bring this vision to reality.

Alarm analysis and alarm simulation

To operate a plant efficiently and sustainably it is not only important to have a well-configured alarm system, but to measure and analyze it continuously. If the alarm system quality has degraded, the reasons for this degradation need to be analyzed and maintenance actions need to be performed.

With S+ Operations the measurement of alarms and events is very easy. Its patented integrated information management system simply logs every system event with millisecond resolution and makes data easily available for further processing.

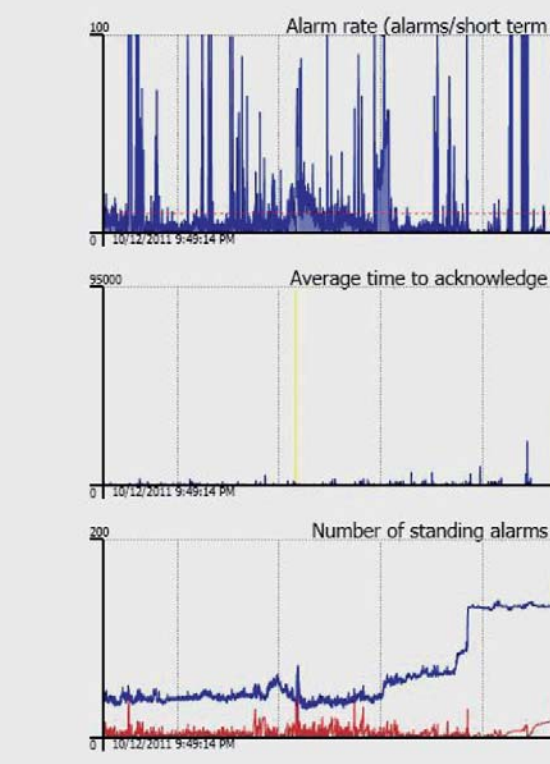
The analysis system offers an extensive array of tools, such as message filters in alarm/event lists and frequency statistics for defined time ranges. Standard report types and statistics are already integrated (EEMUA 191 / ISA SP 18.2), and additional analysis is easily configurable. Based on the unrivaled performance of the S+ Information Management module, even highly complex alarm analysis simulations are possible.

Operator friendly HMI gives fast access to actual values

When an alarm is triggered, an operator's response is based on the information and sequence of events data available via the alarm list. The better this list is, the more appropriate the operator's reaction will be and the quicker the problem will be resolved in the manner intended. The way an alarm is presented dictates how effectively it is handled.

In S+ Operations operator's workplace, the view of messages can be set individually. Alarm messages can be sorted, filtered and reformatted, and comments for individual alarms can be entered and recorded in the alarm list. Color identification for different alarm priorities gives a clear overview.

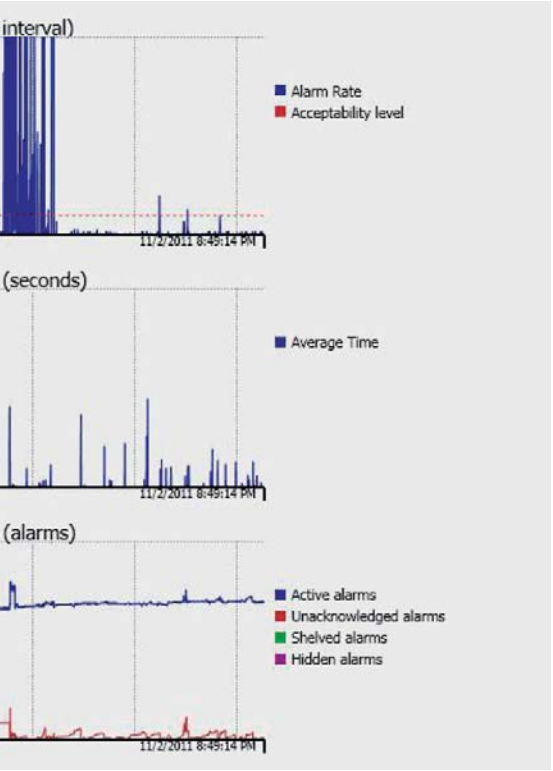
The visible part of S+ Operations



Alarm frequency analysis

Alarm management is one of the most undervalued and under-utilized aspects of process automation today.

Source: ARC Alarm Management Strategies



alarm lists always gives direct access to the actual values of the parameters that have triggered the alarm. Additionally, statistical evaluations are integrated directly with the message client to improve the search for each cause of disturbance.

Should a situation become urgent, the operator needs support to shorten the time from the alarm occurring to finding the root cause and taking corrective action. S+ Operations alarm management provides this support with direct access from the alarm message to all available alarm-related information such as faceplates, graphic displays, operating manuals and live video images.

State-based alarm hiding removes unnecessary alarms

Optimizing operator workload - and thus improving effectiveness especially in critical situations - is a key function of alarm hiding.

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, such as 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 grouping replaces long lists of alarms

The aim of alarm grouping is not unlike that of alarm hiding: to reduce the number of events listed, thereby helping operators to handle key tasks with their full, undistracted attention.

A group alarm is a single alarm that is presented instead of several individual alarms. These individual alarms are 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 whole process; for instance, not only that an alarm has been triggered for a designated tank, but also the risk of leakage from that tank. By both reducing the number of alarms and making them more informative, alarm grouping helps operators concentrate on the right reaction to prevent or reduce damage from occurring.

Alarm shelving helps operators to stay focused

Shelving allows operators to decide whether or not to put an alarm 'on the shelf' for a defined period of time or a certain occurrence. This temporarily moves the alarm 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 of a higher priority.

Modern alarm management - bringing together safety and efficiency

Working with S+ Operations' user-friendly alarm management system improves the operator's ability to navigate, analyze and act in a timely and correct manner. Knowing at once what an alarm means and how best to deal with it increases plant availability, flexibility and productivity. As well as helping to protect the investment made in the facility, this also protects the people working there and the surrounding environment.

An alarm is an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition requiring a response.

Definition of the term 'alarm' according to ISA-18.2

ABB completes acquisition of Powercorp

The acquisition strengthens control solution portfolio to manage the integration of renewable energy into micro grids.

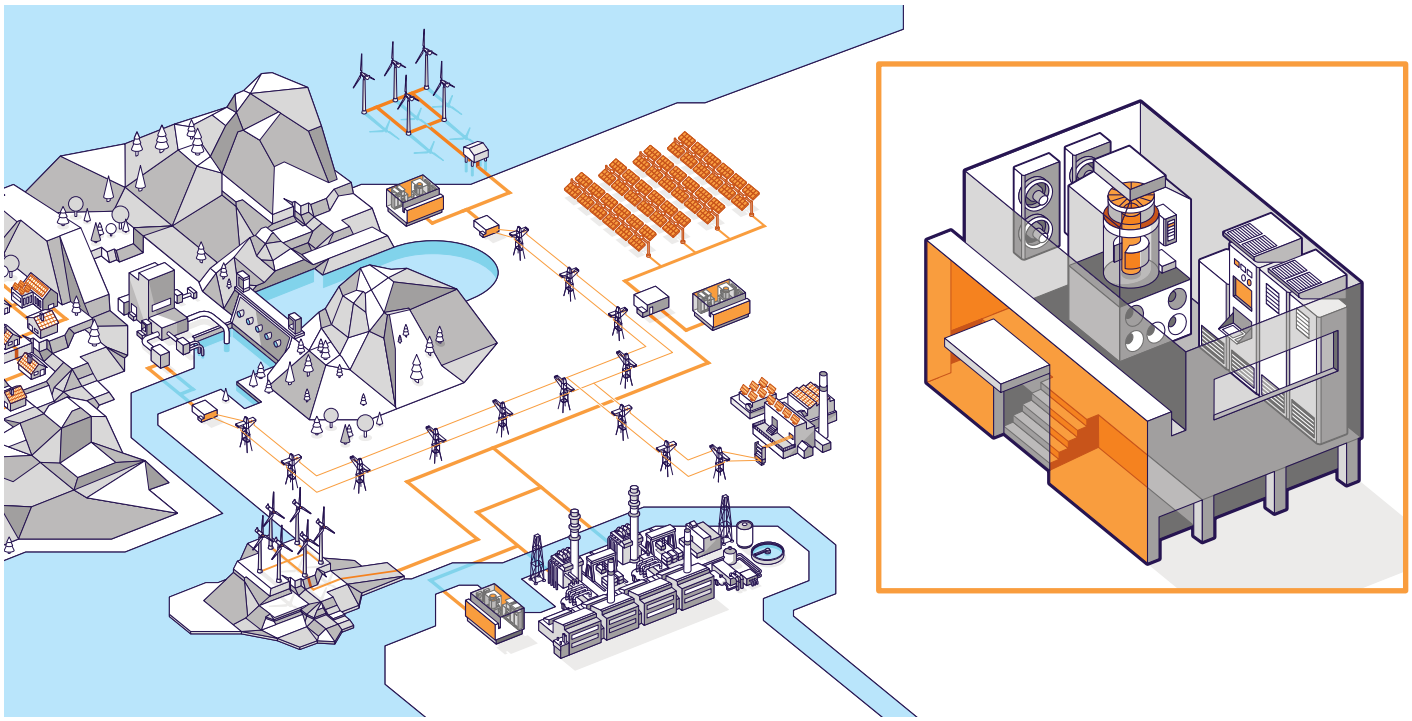


ABB completed the acquisition of Powercorp, an Australian renewable power automation company, in December 2011. The acquisition strengthens ABB's portfolio of control technologies for managing the integration of renewable energy sources.

The company's offering includes automation and intelligent control solutions to manage renewable energy generation in isolated grids, ensuring utility grade power quality and grid stability. This enables very high levels of wind and solar power penetration into isolated diesel powered grids, thus reducing emissions and dependency on fossil fuel.

Powercorp brings expertise to ABB in the integration of renewable energy generation into conventional micro and remote island grids. The acquisition adds specialist know-how and solutions to ABB's control systems offering and further strengthens its position in renewable energy.

Powercorp has installed several systems to integrate renewable power into remote grids and keep generation in balance with consumption. The company also supplies systems that dynamically store and release energy in response to frequency and voltage deviations, to stabilize small or remote grids.

The acquisition adds specialist know-how and solutions to ABB's control systems offering and further strengthens its position in renewable energy.

ABB invests in water network monitoring company

TaKaDu monitoring solutions enable high network efficiency and help reduce water losses.

ABB announced in April 2012 its decision to invest in TaKaDu, a provider of advanced monitoring solutions for water distribution networks. The investment was led by ABB Technology Ventures, ABB's venture capital arm in a $6 million funding round that also included existing TaKaDu investors Emerald Technology Ventures, Gemini Israel Funds and Giza Venture Capital.

The investment gives ABB access to a field-proven monitoring system that complements its automation portfolio for the water sector. This includes a range of power and automation products and integrated solutions that allow customers to produce, transport, distribute, treat and utilize water efficiently, reducing energy consumption, minimizing losses and improving reliability.

TaKaDu provides a software-as-a-service (SaaS) solution that can detect and alert in real time on water network faults, leaks, bursts, network breaches, faulty meters, and other inefficiencies. The solution is based on sophisticated cloud-based data analysis and requires no network changes, additional devices or capital expenditure. It leverages multiple data sources including inputs from network operations, online sensor based flow and pressure data and other external influencers such as weather and calendar events. This data can all be securely accessed over the Internet.

Among its many benefits, this technology can deliver significant reductions in water losses, often referred to as Non-Revenue Water (NRW). The World Bank estimates global water loss at 25 to 30 percent, representing a $20 billion cost savings opportunity. The problem is further exacerbated by the continued increase in demand for water around the world and aging infrastructure.



TaKaDu's solutions have been rolled out by leading water utilities in ten countries and have earned international recognition as an environmentally friendly technology including the Technology Pioneer award from the World Economic Forum in 2011.

"This strategic investment will facilitate marketing and technical synergies with ABB, a global leader, and help us to pursue our vision of making water networks smarter through advanced technology," said Amir Peleg, Founder and CEO of TaKaDu. "TaKaDu's innovation in the water space is a great match to ABB's market position and approach."

"TaKaDu's innovative solution enables commercial water network operators to monitor their distribution networks efficiently and reduce losses. Water is a key focus area for ABB and this investment will further strengthen our power and automation offering for the sector."

Franz-Josef Mengede, Head of ABB Power Generation

S+ Uvisor SF810



The S+ Uvisor SF810 flame scanner family now includes features that provide live temperature information of the flame being monitored.

The addition of a flame temperature measurement functionality enables the user to individually adjust the fuel, primary and secondary air flow, and trim each burner flame temperature to the optimal value. Achieving the optimal flame temperature helps minimize carbon in ash, NO_x and CO_2 production at the burner and improve overall combustion efficiency. This adds considerable value to the S+ Uvisor SF810 flame scanner and its principal safety and protection capability.

The new functionality enhances the field-proven safety functionalities of the existing product series.

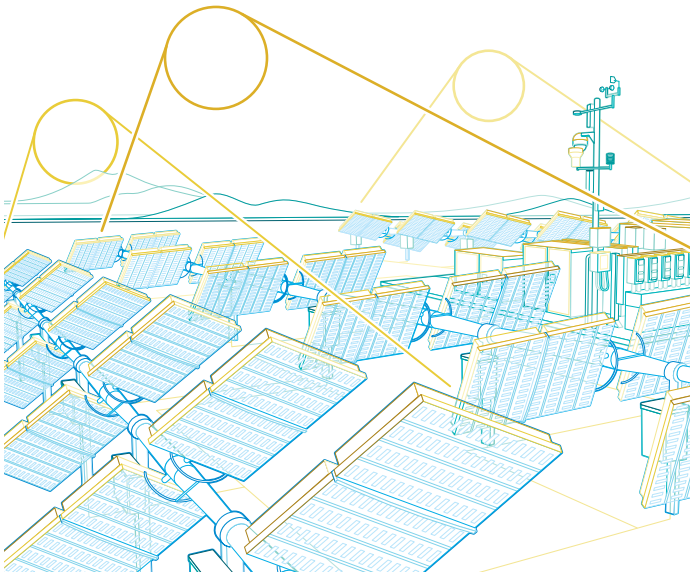
Advantages

- Live measurement of the flame temperature
- Local combustion process assessment and diagnosis
- Suited for Low NO_x burners and sulfur recovery
- Single point measurement for safety and temperature
- Manual burner control or automatic tuning improves efficiency

ABB is a leading provider of integrated power and automation solutions for conventional and renewable-based power generation plants and water applications like pumping stations and distribution plants. The company's extensive offering includes turnkey electrical, automation, instrumentation and control systems supported by a comprehensive service portfolio to optimize performance, reliability and efficiency while minimizing environmental impact.

Application focus in the next issue:

Solar



North America

ABB Inc.
Power Generation
Wickliffe, Ohio, USA
Phone +1 440 585 3087
E-Mail powergeneration@us.abb.com

Europe

ABB
Power Generation
Mannheim, Germany
Phone +49 621 381 3000
E-Mail powergeneration@de.abb.com

Asia

ABB
Power Generation
Singapore
Phone +65 6776 5711
E-Mail powergeneration@sg.abb.com

For general power generation
www.abb.com/powergeneration

Subscription
For a printed or electronic subscription, please contact the editor or subscribe online at **www.abb.com/powergeneration**

Publisher
ABB Ltd
Business unit Power Generation
P.O. Box 8131
8050 Zurich / Switzerland
Phone +41 (0) 58 585 39 56

Circulation
Electronic issue 3,500
Printed issue 7,000

In Control is published three times a year by ABB Power Generation in English and is available in printed and electronic versions. In Control is free of charge to those with an interest in ABB's power generation and water business.

Disclaimer
The information contained herein reflects the views of the authors and is for informational purposes only. Readers should not act upon the information contained herein without seeking professional advice. We make publications available with the understanding that the authors are not rendering technical or other professional advice or opinions on specific facts or matters and assume no liability whatsoever in connection with their use. The companies of the ABB Group do not make any warranty or guarantee, or promise, expressed or implied, concerning the content or accuracy of the views expressed herein.



Symphony Plus Total Plant Automation. The power of a well-orchestrated performance.

Symphony™ Plus is the new generation of ABB's total plant automation for the power and water industries. Designed to maximize plant efficiency and reliability through automation, integration and optimization of the entire plant, Symphony Plus offers a simple, scalable, seamless and secure solution. Tune to Symphony Plus and experience the power of a well-orchestrated performance. **www.abb.com/powergeneration**

ABB Ltd.
Business Unit Power Generation
P.O. Box 8131
8050 Zurich, Switzerland
Tel. +41 (0) 43 317 5380

Power and productivity
for a better world™