Special edition The customer newsletter of ABB Power Generation 2011



Defining great performance

Introducing Symphony[™] Plus 4 Total plant automation for the power generation and water industries Controlling China's clean-coal power plants 12 Supercritical power plants Complete control solution for super thermal power plant expansion 14 Complete ABB ICE solution Fully integrated plant control 16 New combined cycle power plant in Tunisia



ABB Power Generation

ABB is a leading provider of integrated power and automation solutions for all types of power generation and water plants. With an extensive offering that includes electrical balance of plant, automation, instrumentation and control systems, and service – along with more than 125 years of expertise and innovation and a presence in over 100 countries – ABB helps optimize performance, improve reliability, enhance efficiency and minimize environmental impact throughout the plant life cycle.

Special edition The customer newsletter of 2011



Franz-Josef Mengede Head of ABB Power Generation

Dear Reader,

As you may already have noticed, this issue of In Control is a 'special edition' in the true sense of the word. It is dedicated not only to one particular theme – defining great plant performance – but also to the much-anticipated release of our total automation solution for the power and water industries, Symphony™ Plus.

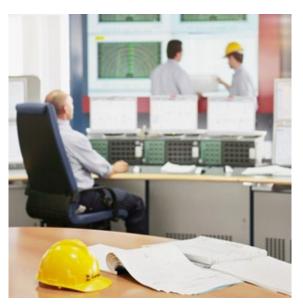
Symphony Plus is the new generation of ABB's widely acclaimed Symphony family of distributed control systems – the world's most widely used DCS in the power generation and water industries. In all, there are more than 6,000 Symphony DCS installations in operation all over the world, more than 4,000 of which are in power and water applications.

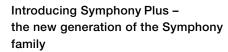
No other automation platform has such a long field record and large installed base in power and water as Symphony. For more than 30 years, ABB has evolved the Symphony family, ensuring that each new generation enhances its predecessors and is backwardly compatible with them – all in accordance with our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

This policy is unique in the automation world, in terms of its scope and longevity. It is based on the acknowledgement that when a customer invests in Symphony, their investment is not only in hardware and software, but in the intellectual capital of their personnel as well. Over the years, plant operators and engineers build up a vast amount of knowledge and expertise in the automation system that they use every day to control the plant and the production process. ABB protects that investment by continuously evolving and enhancing the Symphony platform.

Evolution and enhancement comes in many forms. ABB is continuously developing new products, new technologies and new functionalities, which are integrated into the Symphony platform to keep it firmly and consistently on the leading edge. Customers can add these products and technologies incrementally or upgrade the platform periodically, whichever suits them best. Their past investments are protected, and system compatibility with future technologies is assured.

The beauty of this concept for our customers is that the control system never becomes obsolete. They evolve the system as their needs and requirements change. There is no 'rip-and-replace,' risk is minimal and the total cost of ownership is the lowest possible.







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With Symphony Plus, ABB is taking the Symphony success story to the next level. Like all its predecessors, Symphony Plus is designed to meet the requirements of plant owners in all geographic markets and in all types of power generation and water treatment. It meets the performance objectives of its various users – in maintenance and operations, engineering, IT and management. And it addresses all the key focus areas of the power and water industries – electrical integration, operator effectiveness, plant life extension, optimization, integration of renewables, and the enabling of smarter grids.

It accomplishes this through simple, scalable, seamless, secure automation.

In this edition of In Control, we invite you to take a closer look at Symphony Plus. We briefly present some of its key attributes and capabilities, before illustrating some of the most recent successes of the Symphony platform across all regions of the world.

Kindest regards,

Franz-Josef Mengede Head of ABB Power Generation

Overview

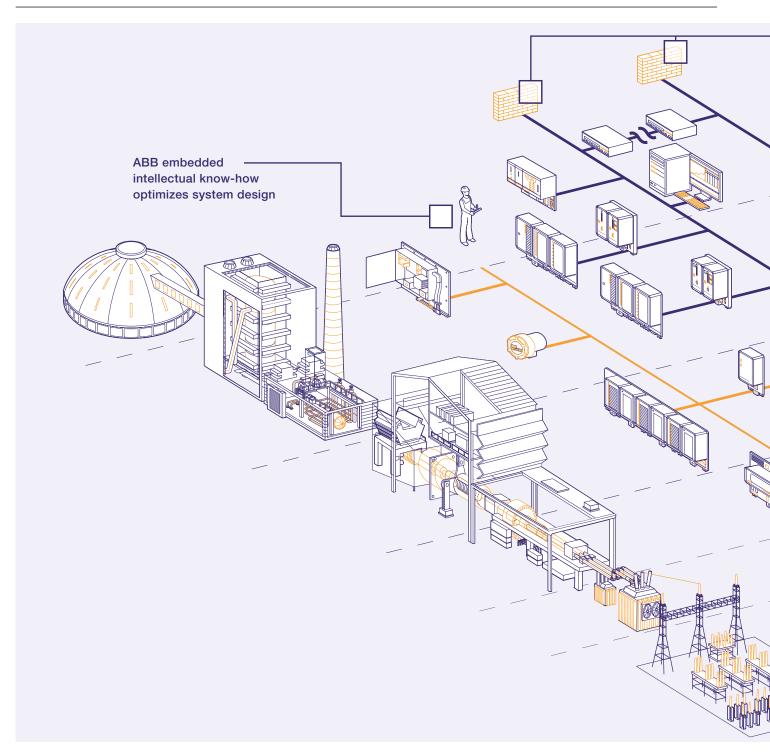
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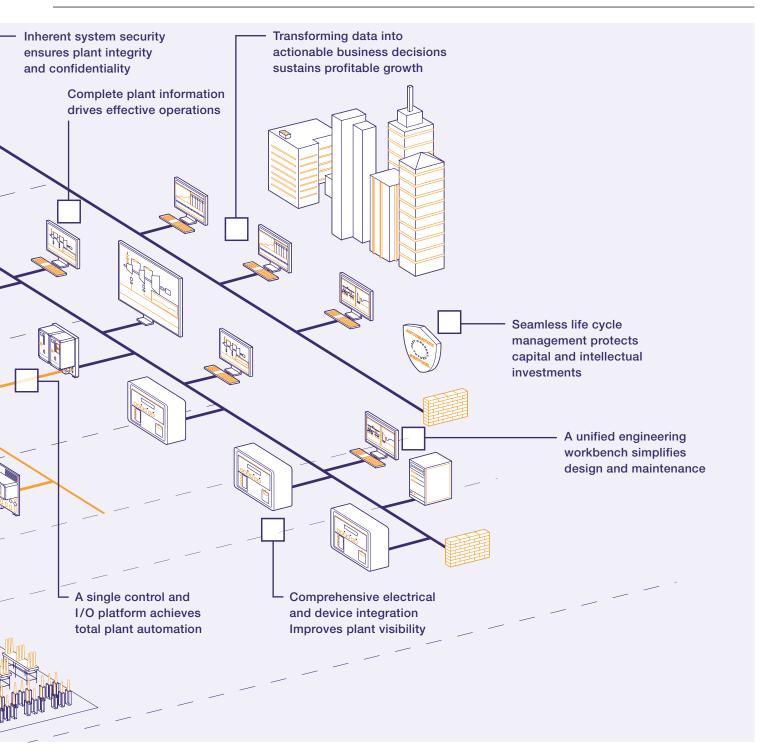
Contact us

19 Regional contacts for ABB Power Generation



Introducing Symp

Total plant automation for the power generation and water industries



hony Plus

ymphony[™] Plus is the new generation of ABB's hugely successful Symphony family of control systems. It is designed specifically to meet the current and future needs of the power generation and water industries. Originally introduced in 1980, the Symphony family has gone through several evolutionary stages over the years. Through our 'Evolution without obsolescence' life cycle policy, each generation builds on and enhances its predecessors, adding new technologies and new functionalities that improve plant performance while protecting the customer's previous control system investments.

As a result of this policy and our long-term commitment to the Symphony platform, there are now more than 6,000 systems installed worldwide, making it one of the largest installed bases of any process automation system in the world.

- 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.



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

Defining great performance

Symphony Plus enables plants and personnel to perform at their peak. It balances performance objectives like asset availability, operational reliability and production efficiency with business goals like asset life extension, carbon reduction and regulatory compliance. In so doing, it provides plant owners with an essential tool for achieving sustainable profitable growth. Its defining features include the following:

Total plant automation

Symphony Plus provides users with a comprehensive view of the plant by integrating data from all plant areas and systems, including turbine control, electrical balance of plant, and remote SCADA systems. Through its open architecture, Symphony Plus seamlessly consolidates and rationalizes plant data to improve operator response to changing conditions, thereby improving plant safety and uptime.

Transforms data into actionable business decisions

Information is the key to successful business performance. In S+Operations, historical, process and business data is collected from across the plant and stored securely. Transforming data into meaningful information, S+Operations presents pertinent, easy-to-understand information in intuitive desktop displays to all levels of the organization.

Unified engineering workbench

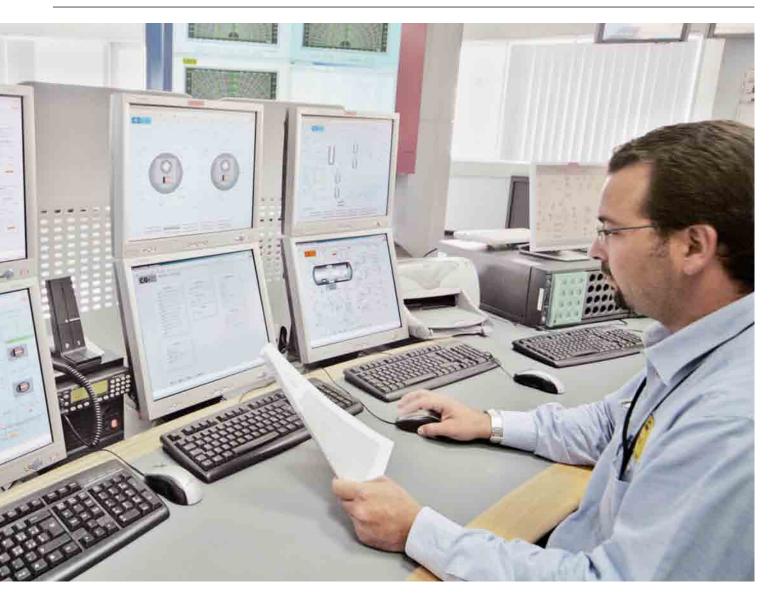
Short time to production is the measure of engineering efficiency. S+Engineering provides a world-class integrated engineering environment, with the requisite functionality to engineer, configure, administrate, secure, commission and maintain any Symphony Plus component – from field devices, electrical devices, control and I/O to operator workplace and gateway configuration.

Embedded ABB know-how

ABB brings more than 125 years of power and water expertise to each Symphony Plus solution. Our expertise has been successfully deployed in thousands of demanding installations across all types of application in the power generation and water industries. We combine in-depth process knowledge with extensive electrical and automation know-how to provide a best-in-class solution embedded with ABB know-how for each plant requirement.

Single control and I/O platform

Symphony Plus provides total plant automation from a single control and I/O



platform that encompasses dedicated interface modules and devices for all turbine types, OEMs and sizes, as well as an unparalleled selection of combustion instruments.

Electrical and device integration

Symphony Plus provides process and electrical control from a single platform. Using open standard protocols like IEC 61850 and Modbus TCP, Symphony Plus integrates electrical devices with process control and plant operations. It provides full integration of just about every type of device, and enables the monitoring and management of all plant assets at all levels of the plant.

Inherent system security

ABB understands the need to maintain a secure, reliable control environment while expending minimal time and effort. In addition to the many security features built into Symphony Plus, ABB actively participates in several major control system security standards committees. The guidance provided by these committees is designed to increase the integrity and confidentiality of all system functions and help prevent unauthorized control system access.

Seamless life cycle management

Evolution and investment protection are the cornerstones of ABB's product life cycle strategy. Our 'Evolution without obsolescence' policy helps customers find a balance between upgrading with new technologies and maximizing the return on asset investments already made. Thanks to this policy, plant owners have the ability to extend the useful life of their systems through evolution and avoid the costly and high-risk rip-andreplace approach.

Life cycle services

ABB offers a complete portfolio of

services, from repairs and spare parts to Full Service[®] contracts and complete plant upgrades and equipment retrofits. ABB services are available to enhance every phase of the plant life cycle, from first concept and front-end engineering to commissioning, operation and decommissioning. With unparalleled process, application and technology expertise, ABB is uniquely positioned to support changing needs and industry requirements.

To learn more about Symphony Plus contact your local ABB sales office or download a brochure at:

www.abb.com/powergeneration

Improving plant performance and operator effectiveness

ABB is providing a turbine control and mechanical upgrade that will improve plant performance and enhance operator effectiveness at a Cleco Power lignite-fired power plant in Louisiana.

BB is providing Cleco Power with an integrated distributed control system for the utility's 650 MW Dolet Hills Power Station located in the United States. The plant is one of four that Cleco Power operates. Located in the state of Louisiana close to the border with Texas, the plant is powered with lignite from a nearby mine and has been in operation since 1986.

Currently under implementation, the ABB solution will replace the existing Westinghouse DEH main steam turbine controls and Westinghouse boiler feed pump turbine controls, as well as the condition monitoring equipment and the mechanical overspeed bolt system for each turbine. In addition to the new DCS, ABB is providing custom-designed mechanical components to enhance turbine operation and reliability.

The solution is based on the Symphony platform and comprises Harmony controllers and Harmony Rack I/O. ABB is also providing several hydraulic components and associated instrumentation, including speed probes and brackets, solenoid trip manifolds, trip status manifolds and actuator replacements that will interface with the Symphony DCS.

Scheduled for completion in 2011, the new Symphony DCS incorporates a number of features designed specifically for the Dolet Hills process. They include enhanced control logic for the boiler feed pump turbine to provide stable control for varying steam conditions, and an emergency trip system for the main turbine generator and the boiler feed pump turbine to improve trip reliability and simplify maintenance. Additionally, ABB is providing fan damper vane pitch control equipment to improve combustion control and boiler efficiency. "We have a long-standing strategic alliance with ABB and look forward to building on our earlier successes together as we implement this new project. This upgrade should improve our unit's performance and provide our operations personnel with more advanced technology to monitor and control plant equipment."

Greg Flynn

Lead engineer, Cleco Power



Dolet Hills Power Station, Louisiana



Kahe power plant, Hawaii

Preparing Hawaii for a clean energy future

ABB control and instrumentation solutions are helping Hawaiian Electric Company to integrate variable generation and prepare Hawaii's most populous island for a clean energy future. The solutions include combustion controls that fire a 90 MW oil-fired unit with 100-percent biofuel – thought to be an industry first.

awaiian Electric Company (HECO) and its subsidiaries provide electric power for 95 percent of Hawaii's 1.36 million residents. The utility's largest asset, the 651 MW Kahe power plant, is located on the most populous island, Oahu. All six units at the plant are equipped with Symphony distributed control systems.

ABB is currently involved in two major projects at Kahe as part of HECO's drive to increase the use of renewable energy in its fuel mix and reduce its dependence on oil.

For the 90 MW unit 3, ABB has recently provided a combustion control solution to enable the unit's oil-fired steam turbine generator to use 100-percent renewable biofuel instead of fossil fuel oil. In a test conducted in January 2011, the unit successfully used 100 percent biofuel to fire the boiler at 100 percent capacity.

The tests found that using biofuel reduced opacity (visibility of emissions) and emissions of nitrogen oxides (NOx) and sulfur dioxide (SO_2) compared to using low sulfur fuel oil.

As a long-term automation partner of HECO, ABB provided assistance with engineering design, implementation and tuning of the instrumentation and controls to allow flexibility for the boiler to burn biofuel only, fuel only or in a combination dual-fuel operation.

Frequency correction

In a second project for the 93 MW unit 4 at Kahe, ABB has provided a turbine control

and instrumentation solution as part of HECO's preparations to integrate more variable generation into the Oahu grid.

The solution involves replacing the existing GE Mark II main steam turbine controls with an ABB turbine control system, which ABB is integrating with the existing ABB combustion controls and Symphony distributed control system. This will provide efficient and coordinated control of unit output and frequency correction, and provide HECO with better grid control to enable the integration of increasing loads of intermittent power.

ABB is providing a complete engineering, installation and construction solution.



Brazil's first clean

ABB is providing a complete and fully integrated distributed control solution for two new coal-fired power plants in Brazil. The plants are the first in the country to use clean coal technology and will help Brazil to diversify its energy mix. Razil has an abundance of hydropower. Around 90 percent of the country's electrical energy comes from hydroelectric power, a significant proportion of which comes from one source: the giant 14 GW Itaipu hydropower plant, the world's second largest after the Three Gorges in China.

To broaden the country's energy mix and reduce its dependence on a single power source, the Brazilian government is encouraging independent power producers (IPPs) to build thermal power plants in specified locations, with the government agreeing to buy the power on long-term contracts.

Among the first of these IPP projects are the 1,080 MW Pecem and 350 MW Itaqui thermal power plants in the





coal power plants

northeast of the country. They are the first power plants in Latin America to use clean coal technology. Both are nearing completion (in 2012 and 2011 respectively), and both will be equipped with complete and fully integrated ABB distributed control systems based on Symphony Melody/AC870P.

Complete plant control

The two plants are jointly owned by energy groups MPX of Brazil and EDP of Portugal. EDP has long been a valued customer of ABB; in fact, the entire fleet of EDP's six power plants in Portugal is controlled by ABB distributed control systems.

The Symphony-based solutions for Pecem and Itaqui will control the entire plant and power generation process – Doosan Babcock boilers, Siemens turbines, balance of plant, plant auxiliaries and the flue gas desulfurization plants, which compared to conventional coalfired technologies reduce sulfur dioxide emissions by 98 percent and virtually eliminate the release of particulates.

The solutions are highly optimized to enable the plants to operate at a high level of efficiency. They include integrated boiler, burner and mill protection systems, which are TÜV and SIL 3 certified for fail-safe operation, and IEC 61850 interfaces to the high voltage substations. ABB is also responsible for engineering, design, supply, commissioning, trial run and optimization.

This single-source solution is extremely beneficial to the engineering, procurement and construction contractors, EFACEC and Technimont. It provides them not only with a single point of responsibility throughout project execution, but with a state-of-the-art solution based on a successful installed base with one of the plant owners (EDP).

ABB is also supplying plant instrumentation and a broad selection of electrical equipment and intelligent field devices, including excitation systems, medium voltage switchgear, circuit breakers and generator circuit breakers.

Controlling China's clean-coal power plants

China is building more supercritical power plants than any other country. A large number of these plants are controlled by Symphony Harmony distributed control systems.

BB has a large installed base of distributed control systems in power plants throughout China and in a comprehensive range of applications – coal, gas and combined cycle, hydro, pumped storage, nuclear and cogeneration.

An increasing number of these installations are for supercritical power plants. Over the past few years ABB has supplied around 70 clean-coal power plants in China with distributed control systems based on the Symphony Harmony platform. Two of the most recent are for greenfield and plant expansion projects in Anhui and Henan provinces in eastern and central China respectively.

In Henan, ABB is supplying a Symphony Harmony DCS solution for phase 2 of the 1,800 MW Dengfeng power plant. The 2×600 MW supercritical units are an expansion of the two 300 MW units in phase 1, for which ABB also supplied a Symphony Harmony solution in 2004. The plant is owned by a subsidiary of CR Power, one of China's largest power generation companies.

In the adjacent province of Anhui, ABB was recently selected by China Power Engineering Consulting Group Corp., China's largest power development and engineering company, to supply a Symphony Harmony DCS for a new 1,320 MW plant at Ma'anshan. The 2x600 MW units are scheduled for completion in late 2012.

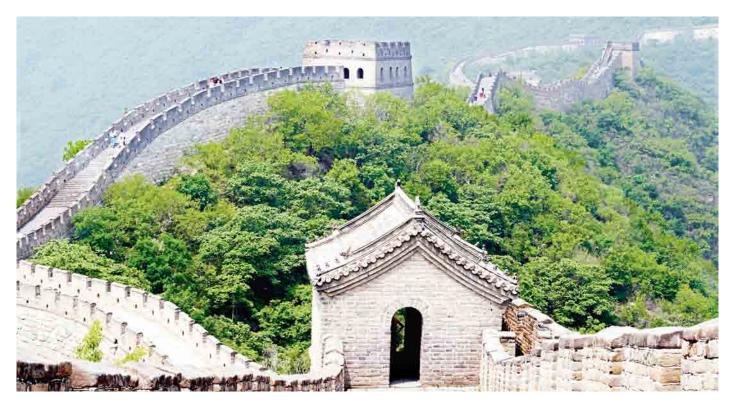
Integrated control solutions

For both projects ABB is providing a complete integrated control solution,

including design, engineering, training and supervision of commissioning. The systems integrated in the solution encompass the entire scope of plant operations, including electro-hydraulic control, electric control, bypass control, SCR (selective catalytic reduction) and flue gas desulfurization control.

Symphony Harmony is widely perceived as the benchmark control system in China's power generation market. Its proven track record in achieving and maintaining high levels of reliability, efficiency and availability is well attested.

ABB's large installed base, extensive local expertise, and long-term commitment to the Symphony Harmony and Symphony Melody platforms were integral to ABB winning the contracts. Speedy project execution was also a key factor.



India

Boosting production and energy efficiency

ABB recently completed the delivery of an integrated distributed control solution for the captive power plant of a NALCO aluminum smelter at Angul, India, one of the largest smelters in Asia. The solution has helped the power plant to generate around 15 percent more energy and has contributed to the site winning a national energy efficiency award for energy-intensive industries.



NALCO's Angul smelter produces up to 345,000 tons of aluminum a year, an increase of 50 percent on the previous capacity of 215,000 tons. The site's captive coal-fired power plant comprises ten 120 MW units, two of which are new.

Ational Aluminium Company (NALCO) selected ABB to provide a cost-effective and proven integrated DCS solution for six of the existing 120 MW units at the smelter's captive coal-fired power plant. The solution is part of a larger expansion and modernization project to raise aluminum production at the smelter and increase power generation capacity.

The solution replaces an old hardwired control system with a state-of-the-art Symphony Harmony DCS that encompasses control, monitoring, instrumentation, and the plant communication and management information systems. It integrates into a single system the various control systems of the six units, including burner management, boiler protection and turbine control.

Precision control

Solution benefits like precise control of the main plant parameters, optimized combustion control, and the smooth and stable operation of all six units have led to substantial improvements in plant efficiency, availability and reliability.

This in turn has made a significant contribution towards the plant breaking its previous production record by generating around 15 percent more power in 2009-10, and to the site winning India's National Energy Conservation Award for efficient utilization and conservation of energy in the energy-intensive aluminum category. Being a captive power plant connected to the national power grid, the control system includes coordinated control of the generating units for safe running in island mode, thereby increasing the availability of the power generated for the smelter. Process information is made available to plant management via Power Generation Portal Web pages, enabling authorized personnel to respond quickly to disturbances in any of the generating units and ensure that the supply of power to the smelting process is not interrupted.

ABB has an extensive installed base of Symphony Harmony DCS solutions at power plants throughout India, including many captive plants serving energyintensive industries like aluminum.

Complete control solution for super thermal power plant expansion

A complete ABB instrumentation, control and monitoring solution for a 1,500 MW expansion at one of India's super thermal power plants has brought a comprehensive range of benefits for NTPC, India's largest power generation company.

he 2,340 MW Kahalgaon coal-fired power plant in Bihar state is one of the largest power plants in India. It is one of around 20 throughout the country with a capacity of between 2,000 and 4,000 MW that qualify for super thermal status.

Prior to the expansion, the plant consisted of four units with a combined capacity of 840 MW. By adding three 500 MW units, NTPC expanded the plant into the super thermal category and almost tripled its generating capacity, making it one of the largest in the country.

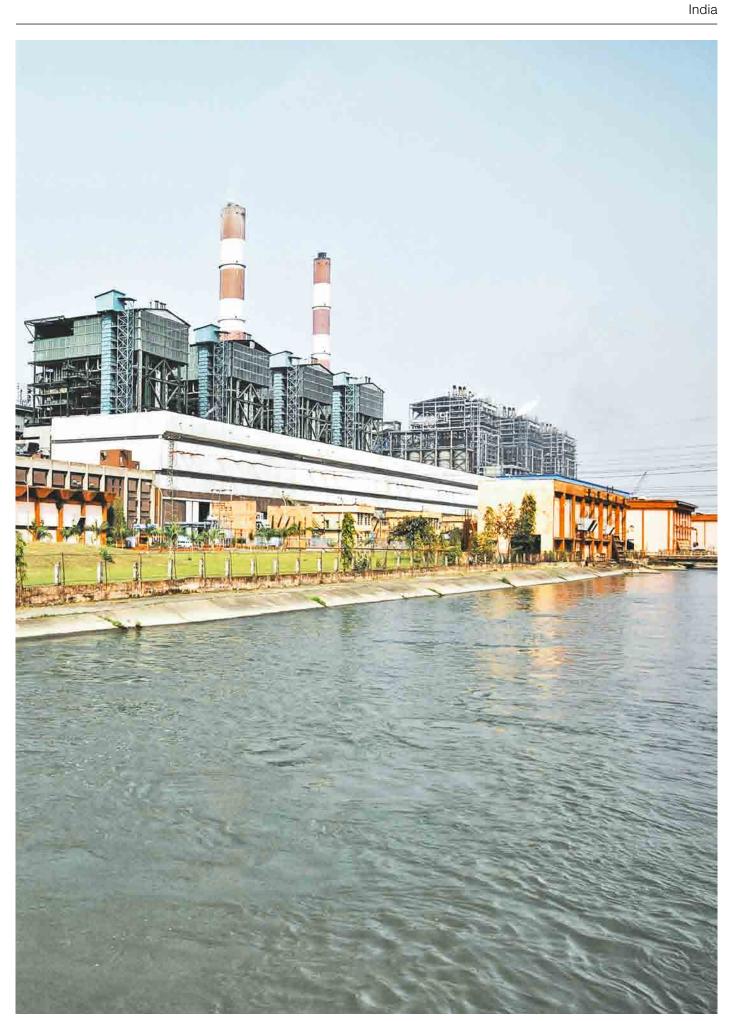
NTPC selected ABB to provide an integrated plant control solution for the 1,500 MW expansion that would secure high levels of efficiency and availability, minimize operating and maintenance costs, and provide a fast return on investment.

The ABB solution comprised the design, engineering, manufacture, installation and commissioning of a Symphony Harmony distributed control system and Power Generation Portal[™] human machine interface encompassing control, monitoring, instrumentation, communications and management information.

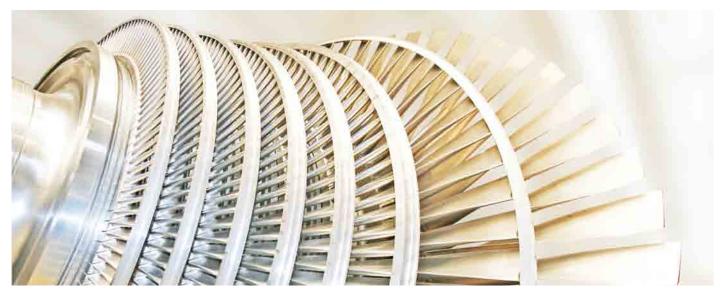
High-performance features

Utilizing the cutting-edge capability of the Symphony Harmony platform for efficient power plant control, the solution provided high-capacity process controllers, advanced function code libraries for application programming, automatic control loops that are optimized to strict tolerances, advanced diagnostics and monitoring, alarm analysis, performance calculation, and single-point integration of data from the boiler and turbine packages. By providing precise control of the main plant parameters (steam, temperature, pressure and output), the solution enables the units to operate at high levels of efficiency, reliability and availability. Stress levels on critical components are also significantly lower, thereby extending equipment life and reducing maintenance and downtime.

ABB's Power Generation Portal publishes process data from all the power generating units as Web pages on the desktops of plant management personnel. PGP provides a superb process overview with state-of-the-art graphics, enabling authorized personnel to access information on the whole power plant from their office as well as from home using the dial-up network.



The 2,340 MW Kahalgoan super thermal power plant provides electricity for five states in northeastern India



Ansaldo steam turbine

Fully integrated plant control

ABB is providing a total plant automation solution for a new 420 MW combined cycle power plant at Sousse, Tunisia. The Symphony based solution integrates process, machine and balance of plant control into the same sophisticated high-efficiency system.

BB was awarded the contract in February 2011 by Italy-based energy group Ansaldo Energia, one of the world's leading suppliers of power generation plants.

Ansaldo Energia and consortium partner SNC-Lavalin are building the plant for the Tunisian state electric and gas utility, STEG. The plant will be situated near the coastal city of Sousse, Tunisia's third largest urban area.

The new 400 MW combined cycle power generating facility will consist of a single-shaft power train fired with natural gas and fuel oil. In addition to fuel flexibility, the plant will have an efficiency of around 58 percent and provide STEG with the operational flexibility to run the plant at base or mid-range load or daily start.

Total plant automation

ABB is providing Ansaldo Energia

with a complete and fully integrated distributed control system for the combined cycle process and balance of plant.

The solution utilizes Symphony Harmony Rack I/O technology and the Power Generation Portal human machine interface (HMI). It comprises a control, monitoring and protection system for the Ansaldo Energia dual-fuel gas turbine, and a turbine control system for the Ansaldo Energia MT15 steam turbine.

ABB has supplied Ansaldo Energia with more than 100 integrated control solutions based on the Symphony platform since 2005. The benefits of these well-proven solutions are substantial. They include a single hardware technology throughout the entire facility, allowing for common spare parts and diagnostics; a single HMI for enhanced operator effectiveness and operations efficiency; a single programming language for sequences, control and protection; and a single platform for the coordination of process and machine control.

As a result of this uniquely unified approach, plant efficiency and energy efficiency are enhanced thanks to a number of solution advantages like integrated control, process optimization through plant performance calculations, condition monitoring of all critical machines, and grid stability control. Benchmark levels of reliability and availability are achieved, operating and maintenance costs are lowered. installation time is short, and environmental impact is minimal thanks to low stack gas emissions and heat rejection.

ABB is responsible for design, engineering, product and system supply, commissioning and training. The plant is scheduled to start production in 2014.

Control and optimization upgrade in Egypt

ABB is upgrading the Network 90 distributed control system at the Damanhour power plant in Egypt and integrating it with the burner management and burner combustion systems to provide a single integrated control system for the entire plant.



Ansaldo steam turbine generator

BB was awarded the contract by West Delta Electricity Production Company to modernize the existing distributed control system at the 300 MW Damanhour thermal power plant in the western Nile Delta.

By evolving the existing Network 90 control system to Symphony Harmony and integrating it with the Symphony Harmony burner systems, ABB will provide a fully integrated automation system based on the same control platform that will improve plant efficiency, availability and safety.

The solution includes ABB's Composer Engineering Tools and Power Generation Portal HMI, which provide a complete set of engineering and maintenance tools and an intuitive operating environment from which operations or management personnel can easily and efficiently access plant data.

Comprehensive solution

As part of its comprehensive scope of supply, ABB is also providing a steam turbine governor, a turbine rotor stress evaluator, water and wastewater treatment control, soot blower, polishing systems and new instrumentation.

ABB is also responsible for design, engineering, manufacturing, dismantling, installation, commissioning and training, including studies for combustion optimization.

ABB sharpens its solar focus

ABB has agreed to buy a 35 percent stake in Novatec Solar (formerly Novatec Biosol), an innovative concentrated solar power (CSP) technology company based in Karlsruhe, Germany.



he investment supports the development of power generation projects with CSP technology, and includes an option to acquire 100 percent of Novatec Solar and an agreement to cooperate on future solar power plant projects.

CSP is a fast-growing sector of the renewable energy market and this investment complements ABB's existing activities in power plant automation, electrification and long-distance electricity transmission.

Novatec Solar is a leading provider of Linear Fresnel CSP technology using

flat mirrors to concentrate the sun's energy onto a receiver to produce steam. The solar-produced steam reduces the need for fossil fuels to generate electricity in existing or new power stations, and also in process plants and other industrial applications where heat is required. Compared with other CSP technologies, Novatec Solar's technology is highly competitive due to its use of flat glass and common steel in low-lying mirror modules that are easy to assemble and install.

"This investment brings us closer to solar power based on CSP technology

and supports ABB's focus on renewable energies, complementing our own power generation offering," said Peter Leupp, head of ABB's Power Systems division. "The technology's simplicity, financial viability as well as minimal water and land requirements are factors that make it particularly attractive in emerging markets, where ABB has a strong position."

"ABB's strategic investment will help position Novatec Solar as a leading global solar company," said Guido Belgiorno-Nettis, Chairman of the Board of Novatec and joint Managing Director of Transfield Holdings, the company's majority shareholder. "ABB is at the forefront of renewable energy generation and integration, and we look forward to working together and expanding the potential of this technology."

Novatec Solar's patented Linear Fresnel technology has been demonstrated with a 1.4 MW plant connected to the Spanish electricity grid since March 2009. The company is currently constructing the world's first commercial 30 MW Linear Fresnel power plant, also in Spain, and recently won an order to retrofit a solar field to a 2.000 MW coal-fired power plant in Australia. Novatec Solar has developed a highly automated manufacturing process and solar field cleaning system. The company, which has about 80 employees, also won the overall Industry as well as Energy and Environment Awards at the 2009 Hanover Fair.

ABB has an extensive offering of products, systems and service solutions for the solar sector, has successfully executed a significant number of turnkey projects around the world and won several recent orders.

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