Staying competitive with service

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Dear Reader,

in this issue of In Control we continue our ‘Application focus’ series by highlighting ABB’s extensive portfolio of life cycle management products and solutions for the power generation and water industries.

ABB electrical, control and instrumentation products and systems are installed in thousands of power and water plants all over the world. In hardware they range from low voltage switches to large power transformers, variable speed drive systems and plant-wide distributed control systems. And on the software side they include cutting-edge solutions for plant optimization, information management and remote diagnostics.

Innovation is a key component of our service offering. In an interview with Enipower on page 6, Mr. Dimitri Gazzotti, head of Enipower’s Engineering and Maintenance department, graciously explains his experience of working with ABB in the field of service and maintenance. He describes some of the solutions the two companies have recently collaborated on. For instance, ABB provided distributed control system functionality that helped Enipower transform its business in a very short time from cogeneration and base load operation to flexible market operation.

A second example of service innovation is our remote operation and maintenance service for photovoltaic (PV) power plants. From two dedicated control centers in Italy and Spain, ABB is offering customers worldwide an advanced remote monitoring service that collects process data in real time, handles alarm and failure detection, provides data reporting, and ensures that the plant is meeting its performance ratio target. The service is currently monitoring PV plants in southern Europe and is a valuable component in our turnkey offering for PV power plant owners.

A third instance of how we respond to our customers’ needs for life cycle service and innovation is provided by the Changi Water Reclamation Plant in Singapore. Changi is the largest plant of its kind in the world today and part of Singapore’s award-winning deep tunnel sewerage system, which in time will channel all Singapore’s used water to the Changi reclamation plant for treatment. ABB is providing the plant owner - Singapore’s national water agency, Public Utilities Board - with service and maintenance of the plant’s extensive electrical balance of plant equipment.

In plant automation we illustrate how our life cycle management strategy for distributed control systems provides plant owners with the ability to extend the operating life of their automation systems and enhance the sustainability of their investments through seamless evolution, thus avoiding the high cost and risk of the ‘rip-and-replace’ approach to system modernization. Our commitment to incremental stepwise evolution has been the hallmark of our Symphony™ family of distributed control systems for more than 30 years. The latest generation, Symphony Plus, enhances its predecessors and is backwardly compatible with them in the true spirit of our ‘Evolution without obsolescence’ commitment.

This commitment to the long-term interests of our customers is one of the contributing factors to ABB being ranked the global market leader in distributed control systems and enterprise asset management systems in 2010 by ARC Advisory, the leading research and advisory company. We are proud to be able to expand on this announcement on page 19.

Finally, we feature a revealing and stimulating discussion on the power and water service market between two senior ABB representatives: Jari Kajja, head of ABB’s global service business, and Stefan Hatt, head of global service for ABB’s power generation and water business.

I trust you will find fresh and fascinating insights into how ABB is working hard to help power generation and water customers achieve the most from their assets through life cycle management and service.

With kind regards,

Franz-Josef Mengede
Head of ABB Power Generation
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ABB offers a comprehensive portfolio of life cycle management and service products for the power generation and water industries – a portfolio based on extensive process and application know-how and one of the largest installed bases in the world.

ABB has been in the power generation industry for more than 125 years and in the water business for more than half a century.

This, and the fact that we are a leading supplier of power and automation products and systems for utility and industry customers, means that we know the processes, the technologies and the applications.

Our philosophy is simple: We protect your investment through the stepwise evolution and upgrading of your electrical, control and instrumentation systems to minimize the consumption of energy, prolong asset operating life, and minimize the cost of ownership.

We do this by providing advanced and cost-effective services and solutions that preserve and increase the value of your facilities throughout their entire life cycle.

Our solutions and know-how are deeply rooted in all applications: combined cycle, coal, hydro, nuclear, waste-to-energy, district energy, diesel, biofuel, solar, water and wastewater, desalination and pumping stations.

Our service spectrum covers the complete scope of the plant’s power and automation systems, from the distributed control and plant optimization systems to the instrumentation and emission monitoring systems. On the electrical side it covers the entire energy path, from electrical balance of plant to the substation and grid connection.

We offer a full portfolio of life cycle management services. It extends from repairs and spare parts to complete plant upgrades and equipment retrofits.

And, it covers each phase of the plant life cycle, from first concept to decommissioning.

For all our products and systems, we offer low-risk evolution strategies that ensure maximum return on investment while enhancing equipment availability and performance.

Energy efficiency and plant optimization

Energy efficiency and plant optimization are two of our specialties.

We perform energy efficiency assessments and use our unique process, product and application expertise to identify savings that can reduce plant energy consumption by between 5 and 20 percent.

And we use that same expertise to optimize plant operations with a broad range of solutions, from computer-based maintenance management systems (CMMS) to online optimization tools for turbines, boilers, membranes, thermal desalination units and pumps, as well as online lifetime assessment monitoring for turbines and boilers.

Our global service network is probably the largest and most decentralized in the power generation and water industries. We have more than 1,300 dedicated power and water service specialists in 56 countries worldwide, ready to respond quickly and proactively to your needs.

Our philosophy is simple: We protect your investment through the stepwise evolution and upgrading of your electrical, control and instrumentation systems to minimize the consumption of energy, prolong asset operating life, and minimize the cost of ownership.
Raising the bar
Taking service to a higher level

ABB has recently strengthened its service offering for power and water customers by enhancing its capability in five key areas:

Your own site-responsible ABB engineer

ABB assigns each service customer their own site-responsible ABB engineer. That person is your single point of contact with ABB for all service issues.

He is locally based and dedicated to provide fast and expert response.

His job is to provide you with the service solution and resources you require, manage ongoing service projects, and work proactively with you to ensure that the plant is operating with the flexibility and reliability required.

We help you identify the plant’s needs

We offer:
– Programs to diagnose inefficiencies, implement improvements and ensure that the improvements are sustained over time;
– Energy efficiency studies to reduce plant energy consumption and comply with ever-stricter emissions regulations;
– Product evolution strategies to improve equipment performance and secure reliability;
– Remote monitoring of electrical and control equipment to monitor status and diagnose faults.

A long-term commitment to our customers

Partnership and a long-term commitment to our customers is the hallmark of our service offering.

For instance, our long-term control system policy of ‘Evolution without obsolescence’ ensures that each new generation of our plant automation platform enhances its predecessors and is backwardly compatible with them.

The policy is now in its fourth decade and is unique in the power and water world. Its principles extend across our entire service portfolio.

As a result of this long-term commitment, we are able to offer a variety of enhanced service contracts with performance-related elements to protect your financial and intellectual investments.

New products, upgrades, retrofits and extensions

ABB has a continuous stream of new products, upgrades, retrofits and extensions in the pipeline.

We can extend the capacity of existing equipment. And we can upgrade or provide evolution or replacement strategies for an aging installed base.

As a partner of ABB, you gain access to the fruits of ABB’s R&D program for power and automation technologies, a program in which ABB invests around $1.3 billion annually.

Third-party service

As the market and technology leader in power and automation technologies, ABB has a unique understanding of the motors, drives, switchgear, transformers, generator circuit breakers, control systems and instrumentation in a power or water facility.

ABB covers the entire electrical, control and instrumentation installed base, and is able to offer service of non-ABB systems on a selective basis.
Responding to the customer's needs: Interview with Enipower

In Control interviewed Dimitri Gazzotti, head of Enipower’s Engineering and Maintenance department, to learn about his company’s service partnership with ABB.

Could we begin with you briefly describing Enipower’s power generation assets in Italy?

Enipower is one of the three largest electrical energy suppliers in Italy, and the largest producer of process steam. We own and operate eight thermoelectric power plants, which together produce 5.4 GW of electricity. Nearly all the sites comprise high efficiency cogeneration combined cycle units that were commissioned between 2003 and 2005. We also provide steam and heated water for two district heating networks in Milan and Mantova. About 20 percent of the power we generate is for the refineries and petrochemical plants of our parent company, Eni.

Can you briefly describe Enipower’s maintenance and engineering organization?

Our objective is to achieve excellence in power plant operation and maintenance. Our maintenance and engineering department is geographically dispersed but highly integrated virtually. The headquarters team (20 engineers) fully supports the local teams (5-10 people depending on plant size) in major overhaul planning and execution, as well as with remote diagnostics and specialist assistance on critical equipment, major upgrades and modification work. The local teams are responsible for ordinary maintenance, emergency work and day-to-day diagnostic and predictive maintenance.

We have developed strong in-house knowledge and resources in instrumentation and control, electrical and high-added-value mechanical activities. We outsource only low value-added activities to local contractors and highly specialized services to OEMs or equivalent high-skill service providers.

What is the scope of your service relationship with ABB?

ABB is providing Enipower with a wide range of services, especially with regard to ABB’s own products and systems. For our distributed control systems and electrical protection control systems, ABB provides us with preventive maintenance, anti-virus checkups, remote diagnostics, emergency intervention, spare part exchange, and life cycle management. For our continuous emissions monitoring systems, they’ve provided new instruments and software that enable us to comply with ever stricter Italian and European regulations.

On the electrical side, ABB provides planned and unplanned maintenance for our high voltage circuit breakers, medium voltage generator circuit breakers, and high and medium voltage transformers. ABB also provides us with maintenance for our performance monitoring systems, and they have helped us to develop and install a control and pre-dispatching platform to coordinate production at five of our plants.

With regard to upgrades and retrofits, ABB is currently providing us with a new turnkey 132 kV grid connection for our plant at Brindisi and a new 250 MVA transformer for another plant.

And in the field of energy efficiency we are currently examining with ABB the benefits of equipping our pump applications with high efficiency motors and variable speed drives.

“I can honestly say that in comparison with other multinationals in the power business I have worked with, ABB is one of the closest to the customer’s needs.”
Plant reliability is a key requirement, not just to ensure grid compliance but to secure the supply of power to Eni production facilities and refineries. In what ways does ABB help your company maintain the required levels of reliability?

Being responsible for the supply of energy to refineries and petrochemical plants means that reliability is a ‘must’ for Enipower. DCS redundancy, efficient remote diagnostics, accurate preventive and predictive maintenance, ‘weak signal’ analysis through plant data and trends management – these are key success factors in which ABB is a reliable partner. Fast response to emergency situations is also very important, and ABB has always demonstrated its commitment to support us in any critical event, and not just with telephone support.

A major goal jointly achieved by ABB and Enipower is the perfect functioning of the load island operation of our ‘large-size’ gas turbines during particularly severe national grid transients, thus ensuring the regular and safe operation of the refineries.

The contract between Enipower and ABB for the distributed control systems is based on a life cycle management concept in which ABB undertakes to continuously upgrade the systems with new products and functionalities. In what ways is this life cycle commitment from ABB important for your operations?

Four of our major power plants are equipped with ABB distributed control systems. This life cycle commitment from ABB is very important for the smooth operation of the plants. It enables us to plan with ABB the partial and progressive upgrade of vital components and software.

Guaranteeing the availability of spare parts and access to technical know-how is fundamental to our maintaining plant reliability, especially when the plant aging factor is increasing. Our guiding philosophy is: We don’t like surprises. That’s why we always try to anticipate potential problems. Our aim is to plan and predict even the unpredictable.

Abb has provided Enipower with DCS functionality that supports your energy trading operations and helps the plants meet regulatory requirements for reduced air pollutant emissions.

Can you describe the background to your requirement, the solution and the results it has achieved?

Enipower asked ABB to support the challenge of transforming in a very short time its business from cogeneration and base load operation to flexible market operation. ABB provided solutions through the evolution of the DCS and the development of a platform to support grid code compliance and trading operations.

The flexibility and user friendliness of the ABB DCS allowed Enipower to easily adapt startup/load variation/shutdown procedures to volatile market requests. Basically, it enables Enipower to quickly adapt load gradients, automatic sequences, unbalance recovery systems, while maintaining full compliance with the grid code, which is constantly evolving.

More recently, Enipower asked ABB to implement cost-effective solutions to monitor air pollutant emissions during transients (startup and shutdown) and comply with all the quality assurance requirements of the regulating authorities.

In what ways has ABB contributed to improving the efficiency of your plants?

ABB has provided us with a solution that monitors the critical plant equipment in each generating unit. This includes the gas and steam turbines, heat recovery steam generator and condenser. The solution 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 solution has been a great success and has enabled us to recover and maintain the highest efficiency levels possible at our plants.

How would you assess ABB as a provider of service and new service technologies? Does ABB meet your expectations?

I can honestly say that in comparison with other multinationals in the power business I have worked with, ABB is one of the closest to the customer’s needs. This is something I appreciate about ABB.

Even though you are a big company, you still manage to focus on the customer and the customer’s needs. We are a small organization in a large company, and we need strong relationships with service and technology providers like ABB.
Getting the most out of plant assets

“Service is a mission-critical business. As a service provider you have to be close to the customer – in all senses of the term. You have to know the customer’s needs and respond quickly and proactively to them at all times.”

In Control spoke to Jari Kaija, head of ABB’s global service business, and Stefan Hatt, head of global service for ABB’s power generation and water business, to find out how ABB service solutions can make a difference to the performance of plant assets.

ABB has made service a strategic priority and has identified power generation and water as two of its core service businesses. Why is this and why should this be of interest to customers?

JK: ABB has a huge installed base in power generation and water. We are one of the largest OEMs in power and water, covering the entire electrical, control and instrumentation scope of supply, including design and engineering, and installation and commissioning. Up until 10 years ago we were involved in turnkey power plant building and were one of the largest in the industry. Today, we are a leading supplier of pumping stations and solar power plants. Power and water is in ABB’s DNA. Our role is to nurture this installed base on behalf of our customers.

ABB is often perceived by power and water customers as a DCS service provider only. Is this perception correct?

SH: Our commitment to our DCS installed base is indisputable. Around 7,000 power and water units worldwide have been equipped with ABB control systems over the past 30 years. DCS remains a priority, and we have demonstrated that with the global rollout this year of our new Symphony™ Plus total plant automation system. Symphony Plus is a dedicated control platform for the power and water industries, which evolves our huge installed base and is backwardly compatible with it. It is the perfect upgrade solution.

But our service activities are by no means limited to control systems. As Jari pointed out a moment ago, we have one of the largest installed fleets of electrical equipment and instrumentation in the industry – transformers, switchgear, motors, drives, generator circuit breakers, measuring instruments, and so on.

We provide standard and advanced service products for all this equipment, and we specialize in using our knowledge of these technologies to maximize plant efficiency and minimize energy consumption.

Being ‘close to the customer’ is a phrase we hear all the time. What does it mean for ABB?

JK: It means many things, but primarily it means that we want the customer to find it easy to deal with ABB. We are a big company with many divisions, business units and product groups, and global and local organizations. The customer can easily go astray. That is why we have long focused on creating an efficient and direct channel between each customer and ABB so that we can learn and understand their needs, respond quickly to them, and provide them with the best service possible.

SH: Trust and competence are key requirements for the customer. They have to be able to trust their service provider and the technical skills of its service engineers. If a plant asset is not functioning optimally or standing still, it costs the customer money. Geographic proximity is also important, as the provider’s ability to respond immediately and have an engineer onsite within a couple of hours can be critical.

Knowing the history of the plant and its specifics is also a key element of successful service and life cycle management. All of these points reflect the
value and importance of a close relationship between customer and service provider.

Most suppliers want a long-term relationship with their customers. In what ways would a long-term relationship with ABB benefit the customer?

SH: This is as important for the customer as it is for the service provider. In a long-term relationship both parties develop things together as partners. They get to know one another, understand one another, and trust one another. It also has a direct impact on the customer’s bottom line.

Let me give you an example. An aging generator circuit breaker developed a fault and eventually broke down at a power plant in Asia recently. Unfortunately the customer didn’t have a service agreement. We pulled out all the stops to deliver as quickly as possible the required spare parts, but it still took 14 days before the plant returned to normal.

With a service agreement, we would have performed frequent preemptive checks and installed online monitoring to minimize the risk of the fault ever developing in the first place and, we would have had the spare parts readily available in case they were ever needed.

Traditional service is by nature reactive (spare parts, repairs, training, etc). Is ABB a proactive provider of services?

JK: Service is not just either or, it’s both. Some customers may only require spare parts, others want a deeper relationship of collaboration and partnership with a proactive service provider. ABB meets both requirements. The value for the customer of the deeper, more proactive relationship can be measured financially. There is no question about the value, for instance, of continuous upgrades. Reduced costs, fewer outages, higher availability – this is well documented in numerous white papers.

ABB has several wide-ranging product programs that provide customers with the framework for a relationship that covers the spare parts/repairs/training aspect, and the deeper proactive aspect. For instance, for the life cycle management of process automation systems we have our software upgrade programs; for advanced support, including for the electrical systems, we have a very successful service program; and for performance-based maintenance in many industries, we have ABB Full Service®.

Being proactive means developing new service products. What can we expect from ABB in the coming year?

SH: The headline news for our customers in 2011 is the global rollout of Symphony Plus – first in the Americas, then in Europe, Asia, India and China. Simultaneously with the rollout, we began to release an extensive range of products to enable connectivity of Symphony Plus with our entire installed base.

Within the next few months we’ll be releasing a new generator control product and additional offerings for and around the generator itself. On the electrical side, we have new online remote monitoring solutions for various components, and we continue to develop new concepts that facilitate the easy replacement and upgrading of various products. And in energy efficiency, we’re releasing a complete offering that ranges from consultancy and energy audits to standard solutions that reduce plant energy consumption.
Does ABB have the capability and expertise to service non-ABB products and systems?

JK: The short answer is yes, we can service most of our competitors’ products and systems. We certainly want to increase our share of this market, but in a controlled and selective manner. Our main focus remains our own installed base, but we are always prepared to service third-party products and systems when a customer requests it and we have the capability to do it.

ABB’s competitors tend to have a centralized service organization, whereas ABB’s is decentralized. Is this a strength or a weakness?

JK: ABB is a global company, but service is a local business. For a power or water plant, service is also mission-critical – as a service-provider you have to be close to the plant. Whereas many of our competitors have chosen to centralize their service operations to a handful of hubs, ABB has chosen a different – and in our opinion – better and more customer friendly route. We combine the strengths of being a global company with a truly unrivaled global service network.

How do you see the service segment developing over the next few years? What will power generation and water customers require from their service partner?

SH: There are several trends that are already evident and which are likely to intensify in the coming years. First, customers in many parts of the world are facing the difficulty of replacing an aging workforce. They don’t always have the critical mass of a company like ABB to retain or replace the knowledge and expertise they lose when their staff retire. Second, following the boom in new power and water plants of the 1980s and 1990s, there is now a need to modernize and upgrade these plants to extend their operating life. Rarely does a company have the critical mass of a company like ABB to retain or replace the knowledge and expertise they lose when their staff retire. Second, following the boom in new power and water plants of the 1980s and 1990s, there is now a need to modernize and upgrade these plants to extend their operating life. Rarely does a company have sufficient engineering resources to perform these renewals and upgrades itself. Third, there are clear changes in consumer demands and grid requirements in many countries. Power generators are now subject to penalties for non-delivery, and consumers are demanding reliable and high-quality electricity. And fourth, customers themselves want to get the maximum performance from their assets and a good return on their investment. ABB is ideally resourced to help on all four counts.

How important is the human aspect in ABB’s service business?

SH: This is a vital element of ABB’s service business, and we demonstrate it by assigning each power and water customer their own ABB site representative for each plant – a single person, whose face and phone number is known to the customer and through whom they direct all their service projects and enquiries. Also, our service engineers are trained to understand that when they enter a customer’s plant, their mission is to ensure that they find the optimal solution to each case, and that their ultimate objective is to maximize the customer’s return on the plant’s assets.
Remote monitoring of PV power plants

ABB has developed a remote operation, monitoring and managing service for unattended photovoltaic power plants. Currently installed in 18 PV power plants in Europe, the service collects process data in real time, handles alarm and failure detection, provides data reporting and ensures – among many other things - that the plant is meeting its performance ratio target.

Remote operation and maintenance of plants is an important part of ABB’s overall service offering for the power generation and water industries.

ABB has been providing remote service and support for thermal power plants for more than 10 years from a dedicated control and operations center in Genoa, Italy. The service has grown rapidly year by year, and now monitors several hundred generating units all over the world.

As a result of its increasing activity in the solar power market - as a turnkey supplier of photovoltaic (PV) and concentrating solar power plants - ABB has developed a dedicated operation and maintenance solution for PV power plants.

“The solution is geared specifically for the needs of PV plant owners, and has proved immensely successful within a very short time,” says Guido Rossi, head of ABB’s power generation service business in Italy. “Within the first nine months alone, we’ve been awarded contracts to provide full-scale remote operation and maintenance services for 18 PV plants.”

The plants range in size from a 0.86 MW roof-top PV plant to a 24.2 MW plant on a 95-hectare site. The plants are operating with a performance ratio of between 80 and 87 percent, which is determined by the customer and guaranteed by ABB for at least the first 12 months of operation.

Rapid market impact

In addition to guaranteeing the plant performance ratio, the ABB solution has a number of compelling benefits, which explain its rapid impact on the PV market.

Like ABB’s remote monitoring for thermal power plants, the PV plants are monitored from either of two dedicated PV control centers in Genoa and Madrid, which use high-speed and secure data transmission connections and are manned solely by accredited technicians.

Besides collecting and storing real-time and historic data on all the critical equipment at the plant, the solution continuously analyzes the data to ensure that the plant is operating at its stipulated performance ratio. If the plant isn’t meeting its production target, the solution notifies the ABB technician who then performs a detailed diagnosis to identify the cause of the problem. The technician can then rectify the fault by remote, or dispatch a service team to the plant if necessary.

In addition to monitoring energy production at the plant, the solution also forecasts energy production over the next 24 hours. The solution’s advanced self-learning algorithms combine historic weather data and next-day meteorological forecasts with the plant’s configuration to calculate the following day’s energy production.

ABB’s remote operations and maintenance solution is available to solar power customers worldwide.

“The solution is geared specifically for the needs of PV plant owners, and has proved immensely successful within a very short time.”

Forecast algorithms

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- Actual production
- Neural network algorithm (Epson Meteo)
- Neural network algorithm (plant)
Software service programs

Improving resource optimization and productivity requires systematic analysis, performance prediction and automation.

Knowledge is 50 percent of winning a battle. Knowing the plausible dangers can help one to prepare and overcome them. The other 50 percent to winning the battle is strategy – having a framework for action.

A study on operations reveals that the scenarios which rank high in the list of concerns are increased failure rates, lost opportunities to grow the business, and obsolescence. One single scenario that keeps an operation manager awake at night is production loss, especially when he knows that his system is working beyond the recommended life cycle. After all, this is a reality in all things, including systems: failure rates run high as they become older.

The DCS (distributed control system) was first introduced in 1975. More than thirty years later, many of these systems are still operational, as they are designed and meant to be. They are a testament to the high pedigree that has spawned the new technologies and functionalities present today. Upon closer inspection though, one will see that many of these systems are made of sedimentary layers of old and off-the-shelf components. This may be the secret to their long life. They are made of spare parts that ensure the mechanical operation of the hardware.

One should still be prepared for production loss when working with mature systems – spare parts notwithstanding. This is because software is the brain behind the ‘mindless hardware.’ Components can only function based on the dictates of the software. We cannot overestimate the consequences of neglecting software updates. It leads to a contagion of events leading to system failure.

Automation Sentinel is an ABB service program that looks after the software on several levels.

Advantages
- Telephone support for upgrades
- Electronic notification of update availability
- Assured system reliability
- Maintain optimum productivity levels
Service levels and inclusions

Maintain
Updates on software maintenance, device library management and technical or product release; Technical phone support for troubleshooting; Software security management; Online access to KnowledgeBank, among others.

Maintain Plus
Same as the Maintain level, with the addition of Software Evolution to newer system family software and new product licences.

Maintain & Evolve
Same as the Maintain Plus level, with the addition of System Evolution to newer control system technology which includes System 800xA.

Contact ABB for details of full package inclusions.

Maintain and Maintain Plus levels
Both levels address a straightforward need: that the automation system continues to run optimally due to the continual updating of the software. These levels of Sentinel service are appropriate for businesses and operations looking to sustain production at status quo, the median of productivity.

Maintain & Evolve
The path of technological advances is not linear. It is a curve. There are innovations that have been termed as ‘disruptive technologies’ because they have, quite simply, caused shifts in the way we do business.

In production, the path of technological advances is also a curve. Innovations in production are transformational or evolutionary, which means new features or functionalities.

In terms of practical application in automation, this means businesses are looking for automation solutions that will allow it to add functionalities in the future, when business conditions and other metrics require.

The Automation Sentinel program has anticipated this. It has a service level called Maintain & Evolve, which looks to building the foundation for evolutions that will give operations the capacity to step up to these new functionalities at their own discretion.

Automation Sentinel is an ABB service program that looks after the DCS software on several levels.
Service in Singapore

ABB is providing electrical balance of plant service for the Changi Water Reclamation Plant, the world’s largest covered wastewater treatment plant and one of the most visionary and innovative water projects on the planet.

The Changi Water Reclamation Plant (CWRP) is one of the largest water reclamation facilities in the world. Along with the Deep Tunnel Sewerage System, the CWRP will collect, treat and purify every drop of wastewater produced by Singapore over the next 100 years, replacing all existing local plants in Singapore.

Located at the eastern edge of Singapore, the plant is mainly underground and is built in a stacked arrangement, thus occupying a land area less than one-third of a conventional layout.

The plant produces cleaned wastewater to the highest international standards, suitable for deep sea discharge in the Straits of Singapore. On the rooftop, CWRP incorporates an operational facility capable of reclaiming potable water that is fit for human consumption or for high-requisite industrial use.

CWRP was crowned the Water Project of the Year at the prestigious Global Water Awards 2009 in Switzerland.

Powering Singapore’s water super-highway

Amounting to a project cost of US$3 billion, the CWRP uses the most advanced technology available to treat two-thirds of the 1.3 million cubic meters of wastewater Singapore generates daily.

The plant is being extended to a daily maximum capacity of 2,400,000 cubic meters - sufficient to accommodate the entire needs of Singapore.

Building the CWRP threw up many technological challenges and ABB played a prominent role in its construction by providing advanced power and automation expertise and products, such as high-efficiency motors and medium-voltage drives that enable critical parts of the process to operate at the highest levels of energy efficiency and reliability. In fact, throughout the entire Changi water treatment process ABB products and systems power, monitor, measure and speed-control crucial process equipment in the liquid and solids treatment modules, sludge drying systems, centrifuges and turbine generators, and effluent pumping station.

"ABB engineers have been very responsive, accommodating and helpful to our maintenance team. For that, we are very grateful and appreciate their efforts and diligence in keeping our critical equipment in good working order."

Water service for CWRP

After the Changi Water Reclamation Plant went into full operation in June 2009, ABB was following up with the customer when it was noticed that CWRP had a demand for a complete service package. The customer had been contacting various ABB departments regarding service requirements, so ABB coordinated a response across several of its divisions and created a single comprehensive service contract offering.

With its wide range of products, systems and services, ABB follows the whole life cycle of Changi Water Reclamation Plant, from engineering to construction, and now, service and maintenance. ABB supports CWRP in identifying the best solutions for their specific needs, including maintenance and asset optimization.

The service contract from the Public Utilities Board, valued at just under US$2 million, is a three-year service and maintenance agreement for the electrical balance of plant (EBoP), which will help ensure reliable and efficient operations at CWRP. The service package includes the maintenance of critical ABB equipment such as high-efficiency, medium voltage motors and water-cooled, medium-voltage drives that power and control the huge pumps at exceptional levels of energy efficiency.

Also covered are high-voltage distribution boards and transformers; medium-voltage switchgear; low-and medium-voltage transformers; and low-voltage switchboards, switchgear, motors and drives.

Under the service contract, ABB provides, 24/7, certified standby engineers and response to site within four hours for critical equipment. A key engineer is assigned to support the customer and internally coordinate various service groups to establish a single point of contact.

Through this contact, ABB helps CWRP to plan and execute regular maintenance. Other value-added aspects of this comprehensive service contract include access to ABB’s Web-based Parts OnLine spare part information and...
ordering system, maintaining the failure log book and supplying basic training and refresher courses for ABB equipment operation.

With ABB’s Logistics Center Asia (LCA) located in Singapore, local fast response on spare parts is available, thus allowing CWRP to minimize their spare parts inventory.

Last but not least, and viewed by the customer as very important, are the local Drive Service Workshops and Motor Service Workshops led by ABB factory certified personnel.

Changi Water Reclamation Plant has recognized how ABB’s service can help increase the reliability and efficiency of their operations.

“We thank ABB for the service provided so far, and also for assigning proficient and efficient engineers to support CWRP. ABB engineers have been very responsive, accommodating and helpful to our maintenance team. For that, we are very grateful and appreciate their efforts and diligence in keeping our critical equipment in good working order,” said Mr. Lim Swee Sen of Public Utilities Board.

Key success factors in service

Despite the wide range of ABB equipment involved in the service contract, the customer perceives just one ABB entity.

This exceptionally easy interface makes it simple for CWRP to run and maintain its equipment. The CWRP maintenance team has peace of mind as ABB personnel will always be there to support and resolve any issues concerning critical ABB equipment. For full clarity, the customer has easy access to ABB’s sales and service engineers via a clear and simple contact chart.
Component monitoring improves plant efficiency

Centrica’s South Humber Bank Power Station in the UK is equipped with an ABB System 800xA distributed control system and ABB’s Power Generation Information Management plant and enterprise information management system. The plant operates on combined cycle and has a generating capacity of 1,266 MW.

Recently, Centrica added OPTIMAX® PlantPerformance software to the system in order to monitor and improve the plant’s process efficiency.

OPTIMAX PlantPerformance is a software package that monitors the performance of plant components, such as gas and steam turbines, the heat recovery steam generator, condensers and heat exchangers.

It provides early warning of equipment degradation and performance deviation, indicates the resulting financial impact of the deviation to the operator, and provides decision support for predictive maintenance and energy trading.

“The UK energy market is constantly changing and a greater emphasis is being placed on running costs. OPTIMAX provides us with a tool to monitor, analyze and improve the plant’s efficiency, thus driving down our production costs. With increased efficiency we can ensure the longevity of the plant, with OPTIMAX at the center of our strategy.” Antony Cooke, automation engineer, Centrica

Rehabilitating the Inga hydropower plants

The Inga 1 and 2 hydropower plants are located on the Inga Falls of the Congo River - the world’s largest waterfall by volume and the world’s second largest river in terms of the volume of water discharged.

Inga 1 and 2 represent the first modest attempt to harness this potential. Built in 1972 and 1982 respectively they have a comparatively small generating capacity of 351 MW and 1,424 MW. Due to wars and lack of finance the two plants have never received maintenance and many of the 14 units are no longer working.

The objective of the rehabilitation project is to return the plant’s low power output to 1,300 MW.

ABB was selected for the project by SNEL (Société Nationale d’Electricité), the national power company in the DR Congo, on the strength of its technical solution and extensive global experience of executing similar hydropower and electrical projects.

ABB’s scope of supply includes dismantling and replacing the medium and low voltage systems, transformers and supply lines, as well as the integration of a new distributed control system for the auxiliary systems. ABB is also responsible for engineering, supply, installation, commissioning, final tuning and power-on. Completion is scheduled for 2012.

In a separate contract ABB has also been selected by SNEL to upgrade the converter stations at either end of the HVDC (high voltage direct current) transmission link between Inga and Kolwezi. The 1,700 km power link was originally designed and delivered by ABB in 1982. At the time it was the longest power transmission link ever constructed.

Extending the life of a 40-year-old steam turbine

ERZ is a municipality-owned company responsible for waste management in Zurich, Switzerland’s largest city. The company manages about 100,000 tons of waste a year, some of which is incinerated at two waste-to-energy plants, one of which is Josefstrasse.

The steam turbine at Josefstrasse was 40 years old and in need of modernization. ERZ selected ABB to replace the existing relay-based steam turbine control system with a state-of-the-art ABB control system. As part of the turnkey contract ABB provided a new governor, new steam extraction control, new motor control center, new control and protection of the turbine hydraulics, and instrumentation.

With this solution the turbine is well-equipped for several more decades of high-performance operation.

“ABB was awarded this project because they listened carefully to our needs. We have clearly seen that ABB knows what they are doing and the offer fitted well with our needs. During a site visit to a recently modernized plant to see a reference of the ABB solution, we received very positive feedback from the plant manager. This convinced us to choose ABB for the modernization of our plant as well.” Erich Zuest, ERZ
Projects

Retrofitting static excitation systems

The Alicura Hydroelectric Power Plant in Argentina comprises four 250 MW units, which were originally commissioned in 1987. The Toshiba generators were equipped with BBC static exciter systems which, after more than 20 years of reliable operation, were in need of replacement.

ABB is currently retrofitting its state-of-the-art UNITROL® 6800 static excitation systems and automatic voltage regulators to the four generators at Alicura. ABB is responsible for project management, engineering, installation and commissioning over a two-year period between 2011 and 2013. The plant is owned and operated by AES Alicura.

Improving power and desalination plant performance

The Doha East Power Station and Shuwaikh Desalination Plant in Kuwait produce 1,158 MW of electric power and 90,000 tons/day of water. They are owned by the Kuwait Ministry of Electricity and Water.

ABB provides a full range of life cycle services for both plants. The solution includes consulting, spare parts, repairs, system and product evolution, training and technical support.

The five-year contract is designed to improve the performance and reliability of both the power and desalination plants. Doha East is one of Kuwait’s five major base load power plants, and Shuwaikh produces 6 percent of the country’s desalination capacity.

Drive system upgrades for Eskom

ABB was selected to refurbish the existing variable speed drive systems for the boiler feed pumps at three Eskom coal-fired power plants in South Africa. The plants have a combined generating capacity of more than 12 GW and are among the largest in Eskom’s fleet.

ABB was able to provide a standard variable speed drive solution for all three plants and for the drive systems of various OEMs. The solution includes standardized dry-type transformers designed to operate both with the existing and new drives.

With extensive local resources in South Africa, ABB was able to assess and refurbish the motors locally and provide fast delivery and the requisite support, including a variable speed drive simulator for training.

Upgrading an 1,800 MW pumped storage plant

The Tianhuangping Pumped Storage Plant is one of the largest pumped storage facilities in China. It is owned by East China Electric Power Group Corporation (ECEPGC).

Located 175 km from Shanghai, the plant plays a vital role in stabilizing the entire East China power grid and the manufacturing hub around Shanghai and the Yangtze Delta. The first of the six 306 MW units was commissioned in 1998 and the remaining five in 2001.

ABB equipped the entire plant with an INFI 90 distributed control system. In 2010, ECEPGC selected ABB to upgrade unit 1 to the latest ABB DCS technology.

Improving fleet reliability and reducing maintenance costs

ABB is contracted by IPR GDF Suez to improve reliability and reduce maintenance and support costs at four combined cycle power plants in the United States. The four plants comprise 14 generating units and have a combined generating capacity of 3,700 MW.

ABB provides modular and flexible service and maintenance solutions encompassing preventive maintenance, 24/7 support line, remote connection service, training, spare parts, repairs and consulting.

Principal customer benefits include quick return to normal operating conditions in the event of a disturbance; reliable budget forecasting thanks to predictable costs; and remote connectivity for immediate response to support needs.
DCS upgrade of 1,260 MW plant in India

ABB was awarded an $18 million contract by Gujarat State Electricity Company Limited in April 2011 for a complete instrumentation and control solution for the Wanakbori Thermal Power Station, which is one of the largest in Gujarat state.

ABB is upgrading the distribution control system for the plant’s six 210 MW units to Symphony™. The solution includes diagnostics and optimization packages, turbine controls, steam generator control, station controls and instrumentation, a steam and water analysis system, flue gas analyzers, control valves, actuators and positioners. The project is scheduled to be completed by 2013.

ABB to upgrade Indonesian power plant with Symphony Plus

ABB has been awarded a contract from PT Pembangkitan Jawa-Bali (PT PJB), a subsidiary of PT PLN, to upgrade its installed base at the Gresik coal fired power plant in East Java, Surabaya, Indonesia.

ABB will replace the existing MOD300 control system with Symphony™ Plus. The system is integrated with a condition monitoring system to monitor, protect and diagnose the turbosupervisory parameters in the plant. ABB will also provide an integrated historian for reliable total plant diagnostic and operations optimization as well as business data storing and archiving for the power plant.

By upgrading their control system to Symphony Plus, PT PJB is able to protect its intellectual capital investment by reusing existing plant operation codes.

This will be the first Symphony Plus project installed in Indonesia. The project is scheduled to be completed by March 2012.

Securing water distribution in Western Australia

The Water Corporation is one of Australia’s largest and most successful water providers, and the principal supplier of water, wastewater and drainage services in Western Australia. Its activities span across an area of 2.5 million square kilometers.

After 15 years of successful collaboration, Water Corporation and ABB formed an Integrated Control Engineering Alliance to enhance their partnership and secure water distribution across the state.

ABB’s network control system is installed at Water Corporation’s Statewide Operations Centre in Perth, from where it monitors and controls more than 300 remote sites and over 25,000 physical I/O points.
ABB tops DCS and EAM market rankings

ABB has been ranked the world’s leading supplier of distributed control systems and enterprise asset management systems for 2010 by ARC Advisory Group.

In its annual studies of the distributed control system (DCS) and enterprise asset management (EAM) markets, ARC Advisory Group, the leading research and advisory company, has ranked ABB as the world’s leading supplier in both sectors.

According to the latest version of ARC Advisory’s ‘Distributed Control Systems Worldwide Outlook,’ which was released in September 2011, ABB increased its market share and retained its leading worldwide market position in the global DCS market in 2010.

In addition to being the overall market leader, ABB was also the ranked leader in several regions and industry verticals.

“Innovation, quality products, extensive industry knowledge and application expertise has enabled ABB to establish a large and loyal customer base,” said Barry Young, principal analyst at ARC and author of the report. “ABB brings together a product, system and service capability that allows them to deliver complete automation and production solutions across a broad range of industries.”

The study corroborates an earlier report published by Frost & Sullivan in June this year. The report, entitled ‘Strategic Analysis of the World Distributed Control Systems Market’, gave ABB a market share two-thirds greater than that of its nearest competitor.

Strong EAM offering

In the second ARC Advisory report – ‘Enterprise Asset Management and Field Service Management Solutions Worldwide Outlook’ – ABB was ranked global market leader in power generation, power transmission and distribution, and the mining sectors, as well as in the Asia and Latin America regions.

ABB has recently strengthened its position and offering in the EAM sector with the acquisitions of Mincom in July 2011 and Ventyx in June 2010. The report ranked Ventyx as the world’s largest EAM vendor in the power generation, water and wastewater industries, and Mincom as the leading global supplier EAM vendor in power transmission and distribution.

“Mincom and Ventyx have complementary strengths across many key industries and geographies, said Ralph Rio, author of the ARC study. “The combination of these two impressive vendors has catapulted ABB into a leadership position for EAM solutions across many significant segments.”

EAM solutions facilitate the management of an organization’s fleet of physical assets over their entire life cycle, from design and production, through commissioning, operations and maintenance, to decommissioning and recycling.

ARC Advisory Group is a recognized thought leader for industrial and supply chain needs, offering market research, advisory services and consulting.

“ABB brings together a product, system and service capability that allows them to deliver complete automation and production solutions across a broad range of industries.”
ARC Advisory Group
System evolution

ABB’s life cycle commitment extends the operating life of plant control systems and improves profitability through evolution

Plant owners make significant capital investment in the system hardware, engineering tools and application software that together comprise their initial distributed control system (DCS) installation. Upon commissioning, plant and corporate personnel add to the investment by enhancing control system components, tuning and refining control application code and developing knowledgeable staff who operate and maintain the plant and control system.

The result of these investments is a highly trained and experienced staff of engineers, technicians and operators, as well as the creation of site-specific control strategies, procedures and graphics that enable the plant to maintain high unit availability and excellent operational performance.

ABB’s evolution strategy aims at supporting those customers who wish to protect and enhance their investments in both the control system hardware and their valuable intellectual property.

ABB’s life cycle management strategy

The Symphony family is a proven automation control system used for demanding applications in various industries. For more than 30 years, ABB has evolved the Symphony family, ensuring that each new generation enhances its predecessors in accordance with its industry-unique life cycle policy of ‘Evolution without obsolescence.’ All told, this family of systems represents one of the largest installed bases of distributed control systems in the world. The majority of these systems are in operation in the power generation and water sectors.

With Symphony Plus, ABB has taken the Symphony success story to the next level. Like its predecessors, Symphony Plus is designed to meet the requirements of plant owners in all geographic markets and for 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 – plant productivity, energy efficiency, operation security, plant safety, and cost of ownership.

Symphony Plus includes the latest products and services from the world’s largest automation supplier. The main components include state-of-the-art HMI offerings that suit different customer needs, depending on their requirements and preferences. Other new functions and technology updates include rack and DIN rail-mounted I/O modules, process controllers, communication modules, and system configuration tools.

Evolution versus ‘Rip and replace’

ABB’s commitment to ‘Evolution without obsolescence’ provides plant owners with the ability to extend the operating life of their control systems and improve the profitability of their investments through seamless evolution, thus avoiding the costs and risks associated with ‘rip-and-replace’ upgrade methods. ABB’s evolution approach offers plant owners the flexibility to upgrade the DCS in accordance with their business needs.
## Evolution advantages versus 'Rip-and-replace' risks

The table below highlights the advantages of ABB’s evolution approach compared to the rip-and-replace alternative.

<table>
<thead>
<tr>
<th>ABB’s evolution approach</th>
<th>Rip-and-replace alternative</th>
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<tbody>
<tr>
<td>Retain proven control application software for:</td>
<td>Control code re-engineering or translation is required. New algorithms result in different process control behaviors and require retuning</td>
</tr>
<tr>
<td>- calibration and control tuning</td>
<td>- errors creating a familiar controller strategy</td>
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<tr>
<td>- permissive and interlocks</td>
<td>- errors recreating a familiar HMI strategy</td>
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<tr>
<td>- startup/shutdown, automatic load runbacks</td>
<td>- operational errors due to unfamiliar system or control philosophy</td>
</tr>
<tr>
<td>- signal scaling and failure modes</td>
<td>- unfamiliar documentation and troubleshooting procedures</td>
</tr>
<tr>
<td>- alarm setpoints and alarm conditioning logic</td>
<td></td>
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<tr>
<td>- simulator tuning and fault scenarios</td>
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<tr>
<td>Process control remains same as before</td>
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Retain plant knowledge base, operations and maintenance philosophy. 
Upgraded engineering tools include documentation that is the same as existing upgraded HMI and affords familiar operational philosophy for: 
- user interface to control action
- situation handling and SOPs
- graphics display and navigation
- system diagnostics
- alarm, event handling, logs, reports, SOE

Upgraded system hardware affords familiar maintenance procedures for: 
- control system maintenance
- diagnostic and troubleshooting procedures
- engineering and online change procedures
- maintenance and tag out procedures

Preserved investment in control system I/O 
- hardware upgrades can be easily implemented, at opportune times, by plant personnel
- offers significant cost savings, less work, less demands on plant resources

Requires massive change-out of system hardware (I/O, controllers, communication infrastructure, HMI and, as a minimum, specialty I/O terminations)

Minimal commissioning and startup (no retuning of loops) 

Long commissioning and startup periods (reconfiguration and retuning of loops)

Results in: 
- minimal loss of production
- minimal risk
- lower project costs

Results in: 
- greater loss of production
- increased risk
- higher project costs

### Rip-and-replace risks

Risk unnecessary plant trips and production downtime due to: 
- errors creating a familiar controller strategy
- errors recreating a familiar HMI strategy
- operational errors due to unfamiliar system or control philosophy
- unfamiliar documentation and troubleshooting procedures

Risk cost escalation and schedule delays due to: 
- executing a large engineering development project
- implementing retuning efforts
- retraining for plant operations, engineering and maintenance
- installation wiring efforts and missed scope
- construction change requests
- extended checkout and startup (I/O checks, logic checks, graphic checks)
- reimplementation and troubleshooting for third-party interfaces
and plant operational needs rather than on component obsolescence.

ABB’s evolution program supports a stepwise approach in which components or process areas are upgraded individually as required during either normal operations or as part of scheduled maintenance activities, while leaving the rest of the system undisturbed.

These options utilize the system to its full potential. Evolution alleviates the need for large capital investment and the resultant cash flow impact associated with a full-scale ‘rip-and-replace’ approach that requires a major outage and cost-intensive engineering, design, and construction efforts. Perhaps the most significant benefit of ABB’s evolution concept is to mitigate the risks associated with ‘rip-and-replace,’ such as poor design quality, resource allocation, plant trips, lost generation, project overruns and commercial/legal issues.

**Collaborative 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.

Individual 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, and allows for changes to the plan as required over time
- Identify and target which plant areas are at 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 and update as required to reflect changing business needs and new ABB solutions. This approach takes the guess work out of the budgeting process. As part of this planning process, specific projects are identified and implemented

Regardless of whether that investment was 1, 5, 10 or 15 years ago, the installed automation system is a vital and sustainable part of the business and manufacturing strategy and can be enhanced and extended for years to come. ABB’s strategy of ‘Evolution without obsolescence’ provides its customers with a platform to help maintain and enhance the existing automation system. This strategy of seamlessly integrating new technology with the existing system lowers the cost of ownership, increases the value the system provides, and extends the life of the system.
Application focus in the next issue:

Total plant automation for the power generation and water industries

ABB Power Generation 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.

Upcoming events 2012

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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 5,000

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Clean power from coal?

Certainly.

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