Industrial IT for Gas Turbine Automation

EGATROL 8

ABB
Sustainable automation solutions in a rapidly changing and increasingly competitive world

For some years now, liberalization has dominated the world of utilities. The term summarizes a variety of trends: privatization, diversification, open markets; all of which contribute to a more competitive business environment for utilities.

Irrespective of the current state of liberalization in local markets, global trends have led to an increased competitive awareness in most utility companies, be it to cope with a liberalized business environment, or to prepare for coming events. Business excellence has become the key issue when running a utility company.

As in many other areas of industrial production, business processes in the utility industry have also become faster and more complex. Maintaining a constant eye on business and technical performance numbers is essential for keeping a utility enterprise on track.

ABB has addressed and met the concerns of utility customers. We deliver competitive solutions based on leading-edge technology, we seamlessly integrate automation and information technology, and we provide both the equipment and the information you need – where you need it and when you need it.
At the Ras Abu Fontas plant in Qatar, ABB has integrated the operation and monitoring systems and delivered a common plant management system for plant B and extension B1 and made them accessible from one common control room. Ras Abu Fontas is powered by eight ALSTOM GT13E2 gas turbines and represents the first Independent Power Producer (IPP) project in the country.
In a world of ever-growing complexity, look for a reliable partner with the expertise you need

Power plant experts
In partnership with customers all over the world, ABB delivers what it takes to successfully run a power plant – from design to operation and from the plant floor to the world outside.

We combine in-depth knowledge of the power generation process with extensive automation know-how to provide an optimized solution for your plant. Years of experience in the field help ABB engineers design automation systems that cover all the requirements of the power generation business. We have a large selection of standard solutions that fully integrate into the processes and structures of today’s power plants.

At the ALSTOM gas turbine test center in Birr, Switzerland, turbines are equipped with two EGATROL 8 automation systems. Constant tests plus experimental operation secure maximum reliability.

Minimize your risk by giving ABB full responsibility for the complete electrical, automation and information scope of your project.
Turbine automation proven by experience

ABB takes full responsibility for the complete electrical, automation and information scope of a customer project. In addition to designing, implementing and commissioning the automation system, we procure electrical and auxiliary systems and integrate them into one single solution that fully meets the specified requirements. Our ability to execute complex power plant automation projects has been proven in more than 400 ALSTOM turbine installations world-wide - from small industrial turbine automation systems to multi-unit combined cycle power plants. Working in partnership with ALSTOM, ABB’s experience goes back more than 40 years and comprises some of the most prominent plants ever equipped with state-of-the-art automation solutions. Throughout this time span, we have applied the most advanced technology to provide the most effective solution. Our automation platform has been expanded and improved by developing specialized devices and software to meet the stringent requirements of power plant automation.
One reliable partner for gas turbine control – throughout the plant life cycle

ABB delivers all the systems required to successfully automate a plant: from the plant floor to the information system, from system design to life-long operation. Throughout the life of your plant, you enjoy the benefits of a single, reliable partner. Design, engineering, commissioning and service – all from one, experienced hand.

Our product development continuously follows state-of-the-art technology and requirements. Close cooperation with ALSTOM helps us track the latest requirements as they happen.

**Integrated solutions**

IndustrialIT solutions seamlessly integrate all necessary plant data to maximize the plant’s efficiency. An important feature of this configuration is the total integration of all the plant’s main functional areas into one common system. The system incorporates a uniform operator interface throughout the plant. All data acquisition functions form an integral part of the system, including operating data counter and built-in sequence of events. For the safety of both personnel and equipment, the system is equipped with an integrated 2 out of 3 (2003) safety system. EGATROL 8 Turbine control can easily be integrated into various applications – from stand-alone gas turbine processes to combined cycle power plants.

**Open system architecture**

Open system architecture allows easy extendibility from a single GT system to a complete combined cycle power plant with all its auxiliary systems control and the latest human system interface (HSI).

Different sub-systems are fully integrated into the turbine control system. A three-channel over-speed protection system protects personnel and machines from danger and damage, while a vibration monitoring system supervises the turbine. Vibration is an important indication of machine condition, and it will trigger an alarm or even initiate a trip if required. To easily integrate the turbine control system into any DCS control solution, a standardized interface is provided to operate the turbine.

**ABB offerings include:**

- **PROJECT EXECUTION** - One ABB project manager takes care of all relevant issues during your project; one competent partner for the whole ABB contribution.

- **ENGINEERING** - All major plant components are tested using a full-scope, real-time dynamic simulator, which allows testing the control software under realistic conditions. This guarantees the high quality of the resulting system, very fast realization, and short commissioning.
**FULL-SCOPE SERVICE** - Customized and high-quality service packages are available for continuous optimization of a plant throughout its lifetime. Supported by ABB’s global service organization with local presence in over 100 countries, ABB’s support line ensures professional support 24 hours a day, 365 days a year. Spare parts management and maintenance for all components in the ABB product range guarantee continuous migration.

**CUSTOMER TRAINING** - ABB offers both application and technical courses where your operators train at either a specialist ABB center or in your actual plant environment using simulator solutions developed to train personnel one-to-one.
Automated gas turbine operation with precise control and high level protection

Gas turbine control
The EGATROL turbine control system is a control and monitoring solution for a full range of gas turbines, including heavy-duty machinery.

EGATROL 8 comprises sequence and drive control in the open-loop controller, and control of analog process variables in the closed-loop controller plus the turbine protection system. The core of the controller is the redundant high performance CPU PM665, which is specifically designed for turbine control.

The Advant Controller AC160 can be optionally equipped with redundant processors that operate in a hot standby mode. The application software is built using standard software module libraries used in all ABB projects, such as different turbine types and combined cycle power plants. This reduces the possibility of errors and increases the overall reliability and availability of the system.

High standardization and modularization provides a high re-use of proven concepts for different types and sizes of gas turbines. The complete fleet of Alstom’s heavy-duty gas turbines is equipped with the EGATROL turbine controller.

The highly modularized solution offers numerous scalable extensions to increase the functionality of the control system. This allows you to extend your solution in different steps and divides your annual budget into manageable projects.

Closed and open loop control
Modular and advanced control algorithms are realized with the application function modules and function block program in libraries. Drive groups or the main drives with their auxiliaries will be coordinated, i.e. the functional group will put the subordinated drive control groups in and out of service according to the programmed process requirements.

Automatic start-up
Operation of the gas turbine is fully automated; the various auxiliaries of the turbine are automatically controlled in a sequential manner. No operator intervention is required, except for selecting the fuel and setting the load.

Protection
Highest priority is given to the protection system. EGATROL 8 contains a SIL 3 certified over-speed protection system according to IEC 61508. The protection is built as a fault-tolerant 2oo3 system, with each protection channel implemented in a separate controller.

Operator interface
In OperateIT, the gas turbine control system has a Windows-based human system interface (HSD) provided locally on the turbine control cabinet and/or remotely in the control room. Clear displays provide all the information...
you need about the machine or plant status. The process flow presentation is optimized in the form of hierarchically-structured process displays to promote efficient analysis of the status of the process and enable rapid operator response. Alarms and events are announced acoustically and visually by alarm lines, and stored as a sequence of events.

**System supervision**

The supervision system monitors turbine speed, vibrations, temperatures and the burner flame. An Operating Data Counter (ODC) records the stresses generated in the machine components and determines the actual state of the machine.

**Greater business efficiency**

ABB delivers all systems required to successfully automate a plant: from the plant floor to the information system, and from system design to a lifetime of operation.
From plant to enterprise throughout the value chain – one integrated solution

**IndustrialIT – integrating architecture**

The use of IndustrialIT standards allows easy integration of other systems like Balance of Plants, synchronization, generator protection, excitation, start-up device, etc., and offers full compatibility with Optimax plant management and optimization packages. The key concept of IndustrialIT architecture is Aspect Object™ technology, which relates each plant object to a software object. Just like the physical object in the plant, the software object has various aspects depending on who is accessing it and for what purpose. ABB Aspect Objects may be organized in a variety of logical structures. Regardless of the arrangement, each Aspect Object maintains its dynamic links to the real device and its associated information.

The list of aspects begins with control code, faceplate, complete electronic documentation, drawings and instructions. Depending on the product and level of integration, additional Aspects may include integral configuration and maintenance tools, control faceplates, graphic symbols, communication protocols, on-line service, remote diagnosis, and much more.

The result is consistent information just one mouse click away from each device. Most of the information required when running a plant is already available in a PC-based application within the IT infrastructure. To allow access to this information and to integrate third-party applications, IndustrialIT architecture is based on open standards wherever possible.
**Seamless information integration**

The ability to easily integrate systems and solutions is based on the integrating architecture available with ABB’s IndustrialIT platform. The protection system is fully integrated into the control system. This results in easy and consistent configuration, faster data access plus the ability to detect a first trip in cycle time resolution. A scalable 2003 design provides high availability and reliability for the whole system.

**Inherent data consistency**

The aspect integrator platform points to all relevant information for any given object in the plant. Keeping this information up-to-date during engineering, commissioning and operation assures that whoever accesses an object gets current information. The information lives with the plant; once entered, it is always available from one source.

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**Efficient operation**

Knowing exactly what’s happening in your plant is the essential first step to optimizing it. With ABB’s IndustrialIT technology, you are always aware of the current status of your plant – wherever you need it.
Use the information to optimize your plant

Performance optimization applications

ABB’s OPTIMAX range of products provides a solution covering basic plant level optimization, reporting and analysis tools, and enterprise level optimization.

- **EMISSION PREDICTOR.** Based on ambient conditions and load schedule, OPTIMAX Emission Predictor calculates the amount of emissions which will be produced.

- **GAS PATH DIAGNOSIS.** OPTIMAX GT Gas Path Diagnosis is an application for quantitatively analyzing the performance degradation in a gas turbine, and detecting measurement errors.

- **REMOTE DIAGNOSIS RADAR.** The primary goal of remote diagnosis is to continuously assess the plant condition, quickly detect

With all your plant data available in the automation system, you can extract valuable information to continuously optimize performance and systematically reduce costs.

Plant optimization
degradation or faults, and identify corresponding corrective actions. OPTIMAX RADAR contains a real-time database to store the raw data. It also provides the remote user with a customized data set.

**High availability and degree of automation**

ABB’s automation solution has been thoroughly designed for the highest availability. All critical equipment can be replaced without interrupting plant operation. Redundancy concepts make sure that no single point of failure can trip a plant.

A high degree of automation provides fully automatic start-up, shut-down and load control of plant functions, turbines, or a complete plant.

**Invest in operator efficiency**

A skilled workforce is a vital asset. Increased operator efficiency can be directly translated into cost savings in the form of optimal plant operation under all conditions. The experience gained from on-the-job training on ABB’s Power Plant Training Simulator ensures that the operator knows the correct action for any given situation.

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Iberdrola is a Spanish utility that operates power plants all over the world. To optimize the overall performance of its fleet, an operations center in Madrid gathers data from all plants in one central location. Iberdrola uses ABB technology.
Continuous solution optimization through service and migration packages

The Amer plant of Essent Energy in the Netherlands was fully overhauled in order to extend its lifetime for ten years longer than planned at the time of construction. The complete retrofit solution for the gas turbine control system allowed to recommission the plant in extremely short time. The new state of the art control system offers new operation possibilities and opens the world to Industrial IT.

Continuous improvements

Our philosophy is to continuously migrate our turbine control systems to the latest technologies. This lets all our customers upgrade their systems to make use of the benefits provided by these technologies.

Even if you own an aged analog turbine control system, we provide you with improved solutions for making use of Industrial IT technology.

FLEET MANAGEMENT. We develop our turbine control solutions using standardized and proven modules and concepts. With the help of configuration management, we are able to support our whole fleet over its whole life cycle. You benefit from our efficient and convenient services such as repair of the complete ABB product range, as well as third-party product support, standardized upgrade or retrofit packages, or spare parts management.

CLEAR UPGRADE PATH. Designed to follow a clear upgrade path, our turbine control solutions let you migrate to the latest technologies. These systems are highly modular solutions with numerous extensions. This solution modularity allows customers to plan their activities in steps and divide their annual budget into manageable projects.
EXTENSION TO MULTI GT/CCPP. The configuration of the turbine control system is based on ABB's standard concepts. An important feature of this configuration is the opportunity to totally integrate all the main functional areas of a plant into one common system. This allows easy scaling of the plant control system from single GT plants to multi-CCPP plants.

Protect your investment

With more than 20 years of experience in Power Plant Automation, we have developed a proven strategy to bring all our turbine control system generations towards IndustrialIT. We take continuous care of our worldwide fleet of over 400 GT/CCPP with support, upgrades and retrofits. Optimal plant operation over many years is only possible with continuous updates of components and systems, be it process components or automation systems. ABB can deliver upgrades to the latest technology in installed systems to optimally protect your investment.

Continuous technology migration and plant care combined with years of experience safeguard your investments in gas turbine automation.

Investment protection
**IndustrialIT for gas turbine automation**

With its strong commitment to the IndustrialIT vision of seamless information integration throughout the enterprise, ABB continues to be the technology leader in power plant automation. IndustrialIT is the platform that ties together ABB’s core products, providing energy and automation to its customers. Over many years, ABB has proven to be a reliable partner in the world of utilities.

Rely on ABB to provide the optimal solution for your plant.