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In recent years, power plants are facing more challenges. With the continuous growth of energy demand and strong global competition, power plants have been expanding their capacity to survive and thrive in the market. Correspondingly, requirements of control system for power plants have risen.

Cost

The cost hikes in power plants have been attributed to factors such as:

- The shortage of non-renewable resources.
- The fluctuation of global economy and the commodity prices.
- Soaring demand for skilled engineers and rise in labor cost leading to increase in power plants’ operating and maintenance costs.
- Recently, power plants are built in larger capacity, with more complex devices and loops control. This brings the risk of greater economic loss in case of system failure.

Environmental Impact

Conventional power generation consumes large quantities of natural resources, and emits pollutants such as CO2, SOx, NOx. In order to mitigate environmental impact, governments and international organizations are putting more effort to impose stricter energy policies at both the national and international level. To generate power in a more environmental friendly way, the power generation enterprise must follow numerous strict government regulations and public attention.

Therefore, there is a need to have a stable, efficient, energy-saving and environmental-friendly system for the power industry.

HollySys is here to help you produce more power with fewer resource consumptions and smaller workforce to raise your efficiency level.
WHAT CAN WE DO FOR YOU?

Providing the Optimum Solution

**Industrial Know-how Solutions with Professional Customization**

HollySys is specialized in the power industry for more than 20 years, covering every type of process in power generation industry. Benefiting from its rich experience in industrial know-how and control solutions, HollySys is capable of providing customers with customized solutions which best satisfies various demands from end users. Its optimized solutions in power generation industry greatly improve the plant automation level, reduce potential manual errors, improve the efficiency and cut down the overall costs.

1) **Boiler-turbine Coordinated Control**
   Different types of coordination modes are supported to meet different coordination needs. Based on boiler-turbine coordinated control, Automatic Generation Control (AGC) subsystem can receive load commands from grid dispatch center and quickly respond to changes in grid load.

2) **Automatic Plant Start-up and Shut-down System (APS)**
   APS is able to organize and coordinate each functional subsystem to be operated in pre-defined procedures automatically when start up and shutting down the unit. These are usually quite complex particularly in large-scale plants such as 600MW and 1,000MW.

   Therefore, the whole unit is able to complete the start up and shut down process in automatic and safe manner, with minimized manual intervention.

3) **Isolated Grid Solution**
   With the increasing scale of intensive production processes, many large enterprises such as iron & steel, as well as pulp & paper enterprises have in-house power plants to improve the economic efficiency. These in-house power plants are typically isolated from the state grid, which are running as Isolated Grid, and more likely to have unstable frequency fluctuation or even breaking down the entire isolated grid.

   Based on years of experience, HollySys’ turbine control system adapts to load fluctuation in isolated grid with excellent primary-frequency regulation functions. The system solution has been widely applied in various isolated grid of power plants in islands and mountainous regions, ensuring stable power supply to the power plant.
Maximizing Up-time

HollySys solution is inherently designed to achieve maximum up-time for the system.

- All the software and firmware, including the graphics, control logic and configurations, can be modified online without shutting down or restarting the system.
- All the hardware modules have the hot plugging ability.

Operational Excellence

HollySys provides a range of value-added software for optimized operation, such as Advanced Process Control (APC), Operator Training System (OTS), Manufacturing Execution System (MES) and Asset Management System (AMS). This assists end users in conducting field operation and regulating control loops more efficiently.

a) Operational level

HollySys’ HMI in operator station, allows access to any process graph and related information with simply one-click. HollySys’ alarm management is compliant with EEMUA191, which helps the operators handle any abnormal alarm smoothly and ensures that the operation runs continuously and stably.

b) Optimization level

HollySys’ APC automatically regulates and optimizes complex loops of great inertia and multivariable coupling. Thus, it reduces loop regulation time, increases regulation precision, cuts down unit energy consumption and improves efficiency. The advanced control software is based on mature optimized models which are gathered from numerous field applications.

c) Management level

HollySys’ AMS provides statistical analysis, trouble alarm and plant lifetime prediction for intelligent devices and instruments. Therefore, the maintenance staff is able to do equipment testing in advance, hence reducing the maintenance times and unexpected shutdown. In the meantime, the managers are able to make right decisions with the help of real-time analysis, statistics, planning and guiding.
Providing Guaranteed Reliability

Fully Redundant Design
A range of full redundancy techniques are utilized to enhance I&C system availability and fault-tolerance. The redundancy design maximizes the system uptime and is used in control network, controller, I/O bus, communication module and I/O modules.

High Fault Tolerance and Availability
- The protection for incorrect wiring to analog I/O module is up to 220 V AC.
- Different operation authority can be set based on the operation level and process area in order to reduce the occurrences of wrong operation in the process monitoring.
- The unique system bus and error-proof design greatly reduces the assembly time.
- The simulation system can provide training to operators before putting into operation, thus minimizing failures.

Strong Environmental Adaptability
- HollySys’ DCS modules have been tested by in-house reliability testing laboratory. HollySys reliability testing laboratory has been certified by TÜV, complying with CE, UL, ISA S71.04.G3 standards, so that the products are able to adapt in corrosion and harsh environment.
- The module implements a design of low power consumption with a unique tilted-insert design, which forms a natural air channel to allow efficient heat dissipation between modules.

Failure Minimization
- The system adopts multiple-isolation design to ensure the failures are contained and not spread to other parts of system.
- The system adopts dedicated secured network switch to avoid cyber storms and prevent virus attacks.
- The online diagnostics and alarm system conforming to EEMUA191 standards, can detect potential hazards and errors to prevent failures.
- The high-precision simulation verifies logic before being put into operation to ensure logic correctness.

Safety Concepts in Design and Production
- Numerous designs verified by high requirements of nuclear safety level are implemented in the system design. For instance, signal quality is verified before logic operation. The output switches to the pre-set safety value automatically, in case of failure.
- Production lines for high-speed railway products with SIL4 safety level are used to manufacture DCS products in order to make DCS more reliable.

Safety System Integrated with DCS Seamlessly
HollySys provides a safety instrumented system with SIL3 level, which can be used in the application of ESD, FGS and BMS. The system can be integrated with DCS seamlessly. Once an accident occurs, safety system will shut down the process immediately to provide additional protection for the whole plant and avoid economic loss.
Providing Maximum Value

More Capacities Solution
The MACS DCS supports the field bus technology. Therefore, it can increase the capacity of the I/O points and instrumentation in control at the field instrument layer. It also greatly reduces the laying of signal cables as well as accelerates the progress of site installation and operation.

Efficient Engineering Delivery
HollySys has a team of professionals, specialized in power industry. Even for a project with tight schedule, this team is able to achieve rapid project delivery with optimum quality.

Full Life-cycle Service of Power Plant
HollySys has been committed to provide customers with full plant life-cycle service, building a long-term and friendly partnership with customers by long-standing industrial experience and field proven technologies. HollySys is able to provide ongoing supports after the startup of process units. The service scope includes continuous improvement of the control strategy, analysis and improvement of the control loop, ongoing operator training, periodic product upgrading and spare part management.

Energy Saving, Environment Friendliness
The HollySys’ optimization software balances energy resources such as water, electricity and gas. It can also optimize the energy configuration and achieve the best optimal energy saving in efficiency.

In the thermal power generation field, HollySys has unique solutions and numerous achievements in desulfurization and flue gas dust removal, thus generating the maximum power with the less amount of coal.
Total Integrated Solution

HollySys provides total integrated solutions in plant instrumentation and control (I&C). The integrated platform encompasses from base production level up to managerial level of the power factory, main & auxiliary systems. This includes providing products such as Distributed Control System (DCS), Turbine Control System, Burner Management System (BMS), Emergency Trip System (ETS) safety system.

HollySys’ total integrated solution is beneficial for information sharing among systems, thus reducing subsystem products’ types and interfaces, as well as spare parts. This eases operators familiarity with multiple systems and products, thus reducing staff training cost. The total solution also helps power plants to achieve the Operational Excellence. The solution achieves production optimization, asset management and safety throughout the entire plant life cycle with long-term focus on improvement of safety, availability and productivity.

HollySys is offering:

- Integrated solution for multiple equipment (boiler, turbine, generator and BOP)
- Integrated solution for multiple control systems (DCS, turbine control, BMS/ETS safety system, field instruments)
- Wide-range unit capacity solutions (up to 1,000MW ultra-supercritical)

<table>
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<th>Main Production Techniques</th>
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<tr>
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<td>Plant Process Management and Optimization</td>
<td>AMS / OTS / APC / Performance Calculation &amp; Energy-loss Analysis (PCEA)</td>
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Distributed Control System - MACS DCS

DCS is the core of plant monitoring and control system. HollySys’ DCS houses the latest technologies with compliance to international standards in order to meet the demands in power generation industry.

DCS system features:
- High reliability as proven by thousands of track records.
- Flexibility in configuration & engineering.
- Low operation & maintenance cost for long-term plant life-cycle.
**Programmable Logic Controller**

HollySys provides PLC series products ranging from micro up to macro scale which are compatible with each other, as well as DCS.

**LE Series (Compact)**
LE series is suitable for applications of 100~500 medium-scale I/O control points. It integrates the flexible structure of small PLCs and the powerful capability of medium PLCs. They are small in size with high speed counting, high speed pulse, absolute positioning and relative positioning.

**LK Series (Macro)**
The LK PLC consists of a set of hardware modules which includes the CPU, communication, and I/O modules that can be combined and configured on the backplane to satisfy a broad range of automation control applications. Depending on application, the I/O control points are scalable according to user’s needs. Its CPU controller can support up to 2,000 digital I/O or 1,000 analog I/O.

**LK Series (Macro, Dual Backplate)**
The updated version of LK PLC does have some differences in appearance and enhancements. It adopt the dual rack redundant structure which can be mounted separately on two racks respectively, A series and B series. HollySys LK PLC has successfully passed Wurldtech Achilles International Certification and become the first to obtain Achilles Level I Certification of large PLC suppliers in China.

**Turbine Control System**
Turbine control is a crucial part in power generation. HollySys supplies customers with a full range of turbine control products and solutions. These turbine control products are integrated with DCS, ETS and other components seamlessly, which:

- Supply a wide range of controller types for different unit capacities.
- Have proven experience in numerous applications for turbine manufacturers.
Burner Management System / Emergency Trip System - HiaGuard

Safety is always the major concern on the critical control such as BMS of the boiler side and ETS of the turbine side. There is a tendency of more and more end users requiring systems with a higher safety Integrity level (SIL 2 or SIL 3). HollySys could meet this requirement using its TÜV SIL3 & CE certified products and rich experience in safety field.

Advantages of HollySys’ Safety Instrumented System (SIS)-HiaGuard:

- Triplex redundancy with diagnostics (2oo3D)
- Compliant with IEC61508 standards
- SIL 3 certificated by TÜV Rheinland
- Suitable for ESD (Emergency Shut Down), FGS (Fire & Gas detection System), BMS and ETS

HiaGuard had been certified as SIL3 by TÜV on 12th July, 2012, and passed the CE certificate in the meantime.

IEC 61508, Parts1 - 7:2010
IEC 61511: Part1 - 3:2004
EN 50156-1: 2004
EN 296: 2003
EN 230: 2005
IEC 61131-2: 2007
IEC 61326-3-1: 2008
EN 50130-4:
NFPA 72: 2010
NFPA 85: 2011
NFPA 86: 2011
EN 61000-6-2:2005
EN 61000-6-4:2007

Advanced Process Control - HAPC

According to statistics, over 80% of the control loops are only PID control in the process industry, but 15~20% of the loops are still hard to control. Therefore, satisfying control effect level cannot be achieved in some “key loops” at application site.

Based on the advanced modeling, HollySys supplies advanced process control software (HAPC) to optimize the operation performance in complex control loops of large lag, non-linear and multi-variable coupling. HollySys’ HAPC consists of a set of software package, including HOLLiAS-DataSAP for data acquisition, HOLLiAS-SysID for model identification and HOLLiAS-APC for multi-variable predictive control.

System Features:

- Matured and advanced modeling, predicting, and control technologies
- User-friendly HMI for model generation and modification
- Proven applications in Taishan 1,000 MW and HulunBuir 600MW power plants
Due to the increasing capacity of plant and complexity of processes, simulation becomes more important as it allows the operators to gain valuable hands-on practices before they actually work in the real workstations. HollySys' SimuPlant Operator Training System (OTS) does not only train the operators but also validate and adjust the process parameters and control logic. The MACS configuration file can also be downloaded to the SimuPlant OTS directly. This means that the SimuPlant can simulate actual MACS operation and provide the most authentic operational experience for operators. HollySys' OTS has been applied in many power plant, such as Taishan power plant, which was first simulation system of 1,000MW in China.
**User’s Benefit**

- The operators will have a deeper understanding of process technology, improve operational skills, reduce human error and ensure safe production by training.
- Technical staff can improve the skills of DCS maintenance and guarantee stable DCS operation through the automation training.
- Developing an emergency plan and improve problem-solving ability through accident scenarios. Thus, avoiding personnel casualty and property damage.
- Exploring the optimal operation procedure and process parameters by adjusting the process parameters. Thus, resulting in the optimal economic benefits.
- Conducting the control strategy testing on virtual platform, adjusting the control strategy to an optimal status.
- Providing a testing and experimental platform for APC and optimization, reducing risks of commissioning.

**TRACK RECORDS**

**Proven experiences:**

- Ranging from small capacity unit to 1,000MW ultra-supercritical unit
- Ranging from green-field plants to brown-field plants
- In production of coal-powder boilers, CFBs, incinerator grates, oil and gas / combined cycle units
- Integration with main equipment of controlled boilers, turbines, generators and auxiliaries manufactured in Europe, U.S., China and India

**Fossil Fuel Power Plants**

- 1,000MW ultra-supercritical units: 18 units
- 600 ~800MW units: 26 units
- 300MW units: >200 units
- Turbine Control: over 3,000 projects ranging from 6MW to 1,000MW
Nuclear Power

- HollySys developed Chinese first control system for nuclear power plant in 1997 and the system is still in service.
- Provides control & monitoring total solution for both conventional island and nuclear island with its proprietary systems.
- Over 20 units’ records with 22 units within the 1,000MW - class.

Renewable Energy

With the gradual depletion of conventional mineral resources, human beings are continuously seeking for renewable energy resources. The concept of green, environmental protection and recycling has been widely popularized and applied to the renewable energy industry.

HollySys provides total integrated control solution and value-added services for thermal control & instrument in renewable energy power generation, such as waste incineration and biomass. HollySys’ solution for incinerator control, Automatic Combustion Control (ACC), has proven maturity in many renewable energy industries.

TESTIMONIALS

The 2×1000MW units DCS project in Shenhua Guangdong Guohua Yuedian Taishan Power Plant (Phase II) is outstanding in terms of safety, economic efficiency and environmental protection, as well as investment control. It is the leading lever in China. The direct station service power consumption rate for power supply coal consumption is 3.77%, which takes lead in China’s 1000MW units. The service rate for protection devices, automation equipments and instruments is 100%. The desulfurization and denitration systems have been put into service in parallel with the main equipment. The overall performance fully meets our design requirements.

From Shenhua Guangdong Guohua Yuedian Taishan Power Plant, China

The Simulator project located in Surabaya utilizes HollySys simulator system. Now the simulator system has successful installed on site and running well. We’d like to continue cooperate with HollySys Company in henceforth.

From Indonesia, PT Indonesia Power

We’ve cooperated with HollySys for several years. During these years, HollySys has always been offering the best quality DCS system and first-class services & supports. With this close partnership, we’ve completed remarkable projects in Turkey, especially for some important end users in power and chemical industries.

From Turkey, ABK
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