HollySys

BROCHURE

HollySys Turbine Control System

Digital Electro-Hydraulic System (DEH)

Emergency Trip System (ETS)

Turbine Supervisory Instruments (TSI)

Intelligence For Excellence

www.hollysys.com

Since entering the field of DEH (Digital Electro-Hydraulic System) in the 1990s, HollySys has accumulated rich industry experience and engineering implementation experience through nearly 30 years of in-depth research on turbine control. Its overall professional and reliable solutions have been successfully applied to small, medium and large-scale plants for units ranging from 3 MW to 1,000 MW. By December 2023, sales of the DEH system had exceeded 6,500 sets. HollySys has also applied for more than 30 patents, and its solutions have gained wide industry adoption and promotion. With HollySys' continuous deepening and innovation of the turbine control technology, it will further promote the vigorous development of DEH, ETS (Emergency Trip System) and TSI (Turbine Supervisory Instruments).

1997 — Developed the first-generation DEH, which was successfully put into operation in Jilin Changshan Power Plant

1998 — Developed high-pressure fuel-resistant DEH for the 200 MW, 300 MW units, which was successfully put into operation

1999 — Obtained the first DEH patent certificate, enabling the successful application of the DDV valve technology in DEH and breaking the constraints of electro-hydraulic converters on DEH

2005 — Developed the DEH for isolated grid operation, which was successfully applied it in many power plants such as Huo Mei, Shandong Weiqiao, etc.

2006 — Developed self-contained DEH, which was successfully applied in various types of units

2008 — Developed a special turbine controller, which was widely used in small-sized units

DEH Achievements

6500+

Patents

30+

Developed high-pressure fuel-resistant DEH for 600 MW supercritical units, which was successfully put into operation in Guohua Hulun Buir Power Plant

2010

2013

Developed and successfully applied the redundant servo module

Developed high-pressure fuel-resistant DEH for 1,000 MW supercritical units, which was successfully put into operation in Fujian Hongshan Power Plant

2015

2016

Developed a fast master control system to meet the fast requirement of ultra-supercritical units

Developed DEH with superior software and hardware, which was successfully put into operation in the Datang Luohe 630 MW DCS/DEH/MEH/ETS project

2020

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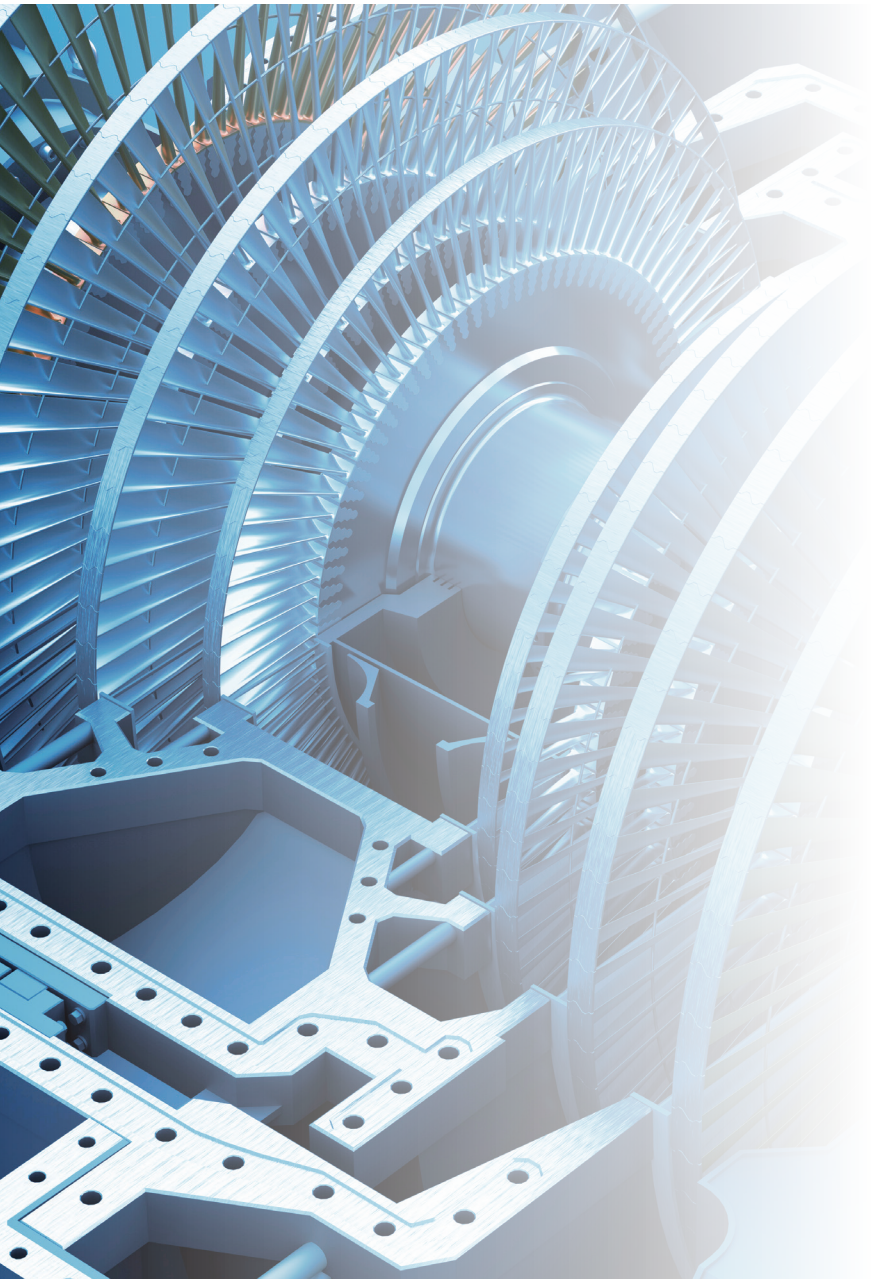

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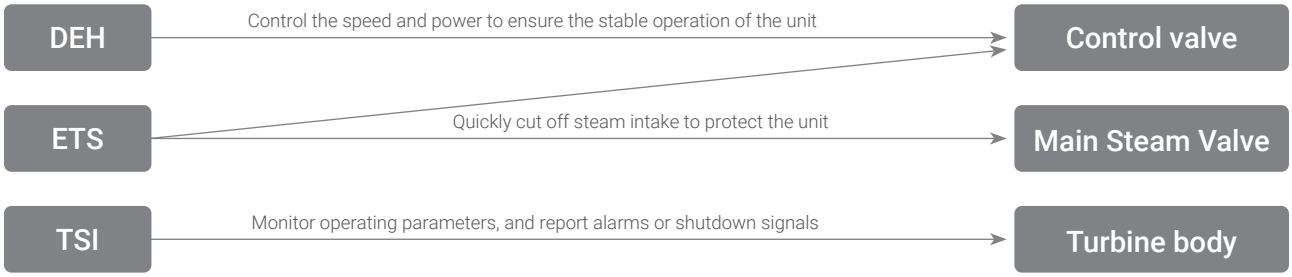
System Overview

As the three necessary systems for turbine control, DEH is mainly responsible for controlling the startup, speed increase, operating under load and load regulation of the turbine to ensure stable operation of a turbine unit. ETS is mainly responsible for automatically and quickly cutting off the steam intake of a turbine when a fault occurs to protect the unit. TSI can continuously, accurately and reliably monitor the important parameters of turbine startup, operation and shutdown through sensors. When the monitored parameters exceed the limit, it can accurately and timely reports alarms or shutdown signals.



Features and Advantages

Intelligent Velocity Measurement

The DEH special speed measurement module (3 out of 2) adopts the latest all-digital circuit, which can generate primary frequency regulation quantity, and cooperate with the servo module to complete the fast primary frequency control function.

Efficient Configuration

With built-in fast DP (redundant) bus and CAN (redundant) bus, the primary frequency control function adopts independent high-speed CAN bus fast communication loop technology, featuring quick response.

Intelligent Servo

The DEH special servo module adopts the latest all-digital circuit, and cooperates with the DEH special speed measurement module to complete the fast primary frequency control function through the CAN bus.

Redundancy and Reliability

Servo module adopts redundancy configuration. Any servo channel can realize online redundant hot standby, and can automatically switch to the standby module when it is judged that the working module is faulty, and the switching time of the servo module is ≤ 10 ms.

Servo valve adopts redundancy configuration. Two servo valves receive command signals at the same time to drive the oil motive to act. When one of the servo valves is determined to be faulty, a closure command is issued to the lockout valve of that servo valve. Subsequently, the remaining servo valve takes over all operations while an isolation electromagnetic valve is actuated to cut off the oil flow. Additionally, a shut-off valve on the oil line is used to isolate the fault point for maintenance, ensuring the continuous operation of the unit.

Quick Master Control

The minimum IEC operating period of the controller is 10 ms, which can meet the rapidity requirements of ultra-supercritical units.

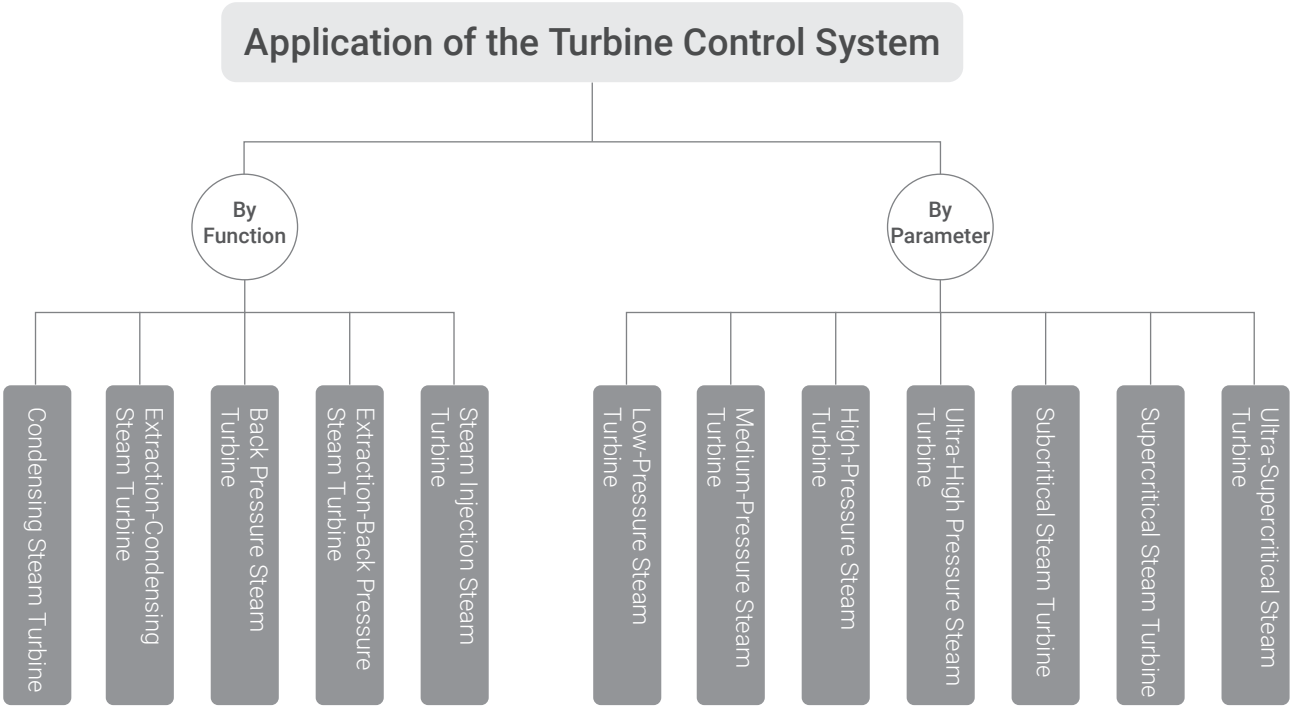
Fast Frequency Regulation

With qualified primary frequency regulation capability, DEH can make the regulation period lower than 30 ms (non-control period).

High-Performance Hydraulic Control

The hydraulic control system utilizes an independent high-pressure 14 MPa control oil source, and the control of the oil-actuated motor is integrated into the servo control system. This hydraulic control system is capable of achieving an oil-actuated motor response time of less than 0.3s.

Applicable Model

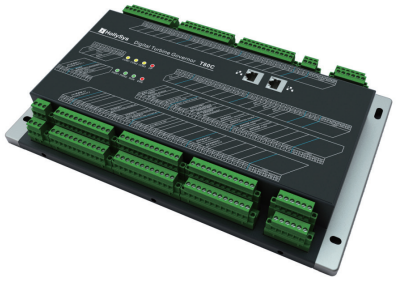


Technical Data

- **Speed adjustment range**
  Turning gear speed at 120% of rated speed
- **Speed measurement accuracy**
  ≤ ±1 r/min
- **Load control range**
  0 to 120%, accuracy 0.5%
- **Speed variation ratio**
  Continuously adjustable within a range of 3 to 6%
- **Control system insensitivity**
  < 0.06%
- **Maximum overspeed at full load**
  < 7% of rated speed and able to maintain idling
- **Steam extraction pressure control accuracy**
  ±0.01 MPa (suitable for C/CC units)
- **Steam extraction pressure unevenness**
  0 to 20%
- **System control cycle**
  < 50 ms
- **Minimum IEC operating cycle**
  10 ms
- **Anti-interference measure**
  Resistance to interference from various electromagnetic waves and communication devices on site, complying with IEC61131-2 and IEC61000-4 standards

DEH

DEH (Digital Electric Hydraulic Control System) is a real-time comprehensive control system for steam turbine generator units. Its primary tasks include adjusting input power, valve positions, and pressure levels to meet external load demands according to customer specifications.



T80 Series Universal Turbine Controller

T80 series universal turbine controller is a special controller suitable for small turbine machinery, which is suitable for single-channel servo loop steam turbine generator units (T80), dual-channel servo loop steam turbine generator units (T80C), and industrial drive units (T80I). The hardware of the controller adopts industrial-grade components to ensure the stable and reliable operation of the controller in the industrial environment for a long time.

System Features

- **Digitization**
  Full digital electric adjustment design, with higher anti-interference ability, built-in servo power amplifier function, capable of driving various electro-hydraulic
- **Ease of use**
  Simple and easy-to-use human-machine interface software, simple parameter settings, clear and reliable
- **Safety**
  Control system designed according to the principles of "fail-safe protection" and "safety self-lock"
- **Miniaturization**
  Small size, compact structure, easy to integrate other equipment, effectively saving installation space

Main Functions

- **System adjustment**
  Speed control, simultaneous grid connection, valve control mode, power control mode, pressure control mode, CCS mode, decoupling mode, primary frequency regulation
- **Limit control**
  Overspeed limit (103% n_0), valve position limit, high load limit, low main steam pressure limit
- **Protection control**
  Overspeed protection (110% n_0)
- **System testing**
  Overspeed test, OPC fast-closing valve test, offline simulation test, leakage test

K Series DEH (T800K)

K series DEH (T800K) is a general-purpose system designed based on HOLLiAS ® MACS-K. It adopts fast master control, dedicated all-digital intelligent servo module, speed measurement protection module, CAN bus fast communication, and is equipped with a full range of I/O redundant modules to meet the stability requirements of different working conditions.

System Features

- **Reliability**
  Full redundant multi-functional bus, realizing full redundant configuration of system power supply, field power supply and communication bus
- **Flexibility**
  Support for redundancy configuration of RTD, TC, AI, AO, DI, and DO as well as the servo module
- **Safety**
  Control system designed according to the principles of "fail-safe protection" and "safety self-lock"
- **Adaptability**
  Dedicated all-digital intelligent servo modules and speed measurement protection modules capable of driving various electro-hydraulic servo valves, LVDT directly connected to the servo control module for modulation and demodulation, and support for isolated grid operation capability
- **Maintainability**
  Modular system design, making troubleshooting and component replacement easy
- **Coordination**
  Shared with DCS data for coordinated control

Main Functions

- **System adjustment**
  Speed control, simultaneous grid connection, valve control mode, power control mode, pressure control mode, CCS mode, decoupling mode, primary frequency regulation, valve management, automatic latching, automatic opening of the main steam valve, and remote control of the EH oil station
- **Limit control**
  Overspeed limit (103% n_0), valve position limit, high load limit, low main steam pressure limit, fast load reduction, low vacuum load limit, back pressure limit
- **Protection control**
  Overspeed protection (110% n_0)
- **System testing**
  Dummy grid connection test, overspeed test, valve exercise test, valve tightness test, high-pressure interruption module test, OPC fast-closing valve test, oil injection test, offline simulation test

N Series DEH (T800N)

N series DEH (T800N) is a general-purpose system designed based on HOLLiAS-N nuclear power plant digital instrument and control system. It is specifically developed for megawatt nuclear power turbine units, complying with the special specifications of the nuclear power industry and meeting the automatic control requirements of nuclear power turbine generator units. It realizes the integrated management of DCS and turbine monitoring and control for nuclear power units.

System Features

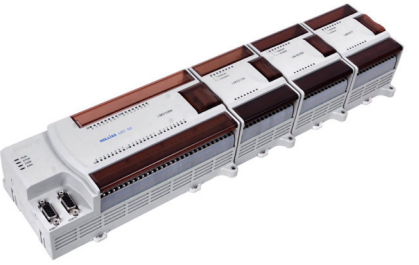
- **Rapidity**
  Minimum opration period of 10 ms, which can meet the requirements of the turbine control of megawatt-level nuclear power units
- **Reliability**
  Support for full redundancy configuration of power supply, controller, network and communication bus as well as fault diagnosis and switching
- **Security**
  Master/slave controller hot standby redundancy, periodically redundantly transferring all data through a dedicated 1000M redundant network to ensure seamless switching
- **Flexibility**
  Special speed measurement module NM635, servo module NM465, and full-digital programmable module, which can be used independently or integrated with HollySys main control systems through Profibus-DP bus

Main Functions

- **System control and adjustment**
  Turbine latching, turbine startup, speed regulation, automatic synchronization, grid connection, load control, valve position control, power control, pressure control, remote control, coordinated control, primary frequency regulation
- **Limit control**
  Overspeed limit, valve position limit, load limit, pressure limit, fast load reduction, flow limit
- **Online system testing**
  Overspeed test, valve exercise test, valve tightness test, OPC action (optional)

ETS

ETS (Emergency Trip System) for turbines is designed to monitor certain parameters that significantly affect the safe operation of the unit. When these parameters exceed the safety operation limits, the system actuates the trip solenoid valve to control the turbine protection system, closing all steam inlet valves to the turbine, initiating an emergency shutdown. Additionally, it provides shutdown diagnostic information to systems such as SOE (Sequence of Events).



PLC-based ETS (ETS-LM)

The PLC-based ETS-LM is developed based on the HollySys LM-G3 series PLC platform, which completes core functions such as data acquisition, calculation, and output. It is suitable for small turbine units. Using PLC system as the main controller has the advantages of fast response, high reliability, long life, centralized management, decentralized control, easy logic modification, convenient increase or decrease of protection conditions, etc.

System Features

- **Rapidity**
  Support for redundancy configuration of the module and power supply, ETS system not affected when any set of PLC fails or any power supply disappears
- **Safety**
  Input and output of the two sets of redundant PLC systems adopting relay for isolation and physical loop hard isolation to ensure system safety and stability
- **Rapidity**
  System control cycle < 20 ms
- **Anti-inteference**
  Anti-interference measures used for resisting various electromagnetic waves and communication equipment on site, and compliant with IEC61131-2 and IEC61000-4 standards

Integrated ETS (ETS-K)

The integrated ETS-K adopts HollySys HOLLiAS ® MACS-K system as the platform, and redundant fast main controllers to form the ETS system, which continuously receives alarms and shutdown signals from the TSI system, DEH system and other equipment of the turbine generator set online, and performs comprehensive logic judgment. The system is suitable for medium and large turbine units. When the normal operation of the unit is affected, various protection signals such as shutdown, alarm and interruption of the unit are sent in time to make the turbine shut down safely, and provide shutdown diagnosis information for DCS and SOE systems.

System Features

- **Reliability**
  Independent system, redundant configuration, independent redundant fast controller and redundant power supply
- **Rapidity**
  IEC operation cycle of 10 ms, 20 ms, 40 ms, 50 ms
- **Anti-interference**
  Anti-interference measures used for resisting various electromagnetic waves and communication equipment on site, and compliant with IEC61131-2 and IEC61000-4 standards
- **Safety**
  Various trip commands, alarms, and partial relay control circuits, and automatically activating the shutdown solenoid to quickly close the steam inlet valve when a turbine generator fault or other fault occurs

Triple-Redundant ETS (ETS-SGM)

The ETS-SGM adopts the HiaGuard SIS (Safety Instrumented System) as its platform, which is developed by HollySys for the safety field of industrial automation and realizes emergency shutdown. HiaGuard is certified by TÜV (Rheinland Industrie Service GmbH) and meets SIL3 safety-related applications as defined by IEC 61508 (2010), and the safety-grade protection unit is a triple modular redundant system.

System Features

- **Reliability**
  SIL3 security level, and two-of-three architecture with diagnosis (2oo3D) used to ensure system security
- **Security**
  Support for degraded operation with a 3-2-0 mode, redundant configuration of I/O modules, seamless switching, and system availability of 99.999%
- **Wide coverage**
  Fault diagnosis located to the channel level
- **High performance**
  SOE accuracy of 1 ms
- **Integration**
  Seamless integration with HOLLiAS ® MACS system, and support for integration with third-party DCS through the Modbus interface
- **Scale**
  Up to 1 main cage and 6 expansion cages supported by a single station, and up to 1856 I/O points

TSI

TSI (Turbine Supervisory Instrument) is a crucial means of monitoring and protecting the safe operation of turbines. It continuously, accurately, and reliably monitors key parameters during the startup, operation, and shutdown processes of a turbine. When the monitored parameters exceed the limits, it can promptly and accurately issue alarms or shutdown signals to ETS. TSI can also output standard 4 to 20 mA signals for monitoring purposes.

Main Functions

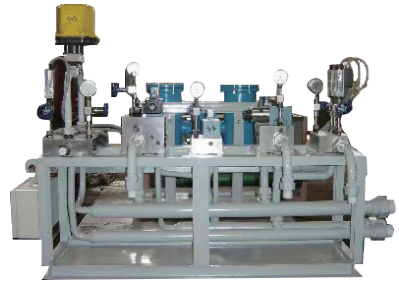
- Speed surveillance
- Axial displacement surveillance
- Surveillance of expansion difference
- Surveillance of bearing bush vibration
- Surveillance of relative shaft vibration
- Thermal expansion surveillance
- Handheld programmer

Electro-Hydraulic System

The hydraulic control system exists in various forms, including the low-pressure turbine oil control system, the high-pressure anti-wear oil control system, and the high-pressure fire-resistant oil control system.

Low Pressure Turbine Oil Control System (EH-HLP)

The low pressure turbine oil control system retains the power oil source from the original hydraulic control system, which is the main oil pump supply method. The control valve actuatoris converted to an electro-hydraulic servo actuator. The control valve is managed through the original valve mechanism (cam or lift plate). The valve position command signal generated by DEH is processed through the servo amplifier board and the electro-hydraulic converter valve, forming the control oil pressure to the throttle valve, thereby actuating the servo motor. The actuator stroke is measured by a displacement sensor and fed back to the input of the servo amplifier board, ensuring it matches the valve position command. This allows the actuator stroke to be fully controlled by DEH.



High Pressure Anti-Wear Oil Control System (EH-ZRS)

The high-pressure anti-wear oil control system includes an integrated independent oil source, providing a qualified high-pressure working oil source for the normal operation of the entire hydraulic control system. The working fluid uses environmentally friendly anti-wear hydraulic oil with turbine oil characteristics, offering the same control precision and fire-resistant properties. This system features high positioning accuracy, large driving force, stepless speed regulation, and rapid shutdown protection, making it highly cost-effective and suitable for small to medium-sized units. Its main components include an independent oil source unit (oil station, accumulator, anti-wear hydraulic oil, etc.), a servo actuator (servo motor, servo valve, OPC solenoid directional valve, etc.), a trip control system, and an oil pipeline system (oil pipelines and various valves).

System Features

- **High precision**
  Independent oil source pressure of 14.0 MPa, and high output stiffness for an actuator
- **Reliability**
  Anti-wear hydraulic oil, no environmental pollution, redundant configuration of the oil supply pump in the oil supply system, and two sets of oil pumps mutually reserved
- **Availability**
  100% continuous adjustable work, and closed-loop servo control system
- **Rapidity**
  Dynamic response time < 0.3s, and fast closing time < 0.2s
- **Convenience**
  Actuator that is compact in size and easy to install, disassembly of the actuator not required for annual maintenance, and replacing only the seals of the hydraulic components on the pump station and actuator

High Pressure Fire-Resistant Oil Control System (EH-HHP)

The high-pressure fire-resistant oil control system includes an integrated independent oil source, providing a qualified high-pressure working oil source for the normal operation of the entire hydraulic control system. The working fluid uses phosphate ester fire-resistant hydraulic oil, offering high positioning accuracy, large driving force, stepless speed regulation, and rapid shutdown protection, making it suitable for large units. Its main equipment includes an independent oil source unit (oil station, regeneration unit, accumulator, fire-resistant oil, etc.), a servo actuator (actuator, servo valve, OPC solenoid directional valve, etc.), a trip control system, and an oil pipeline system (oil pipelines and various valves).

System Features

- **High precision**
  Independent oil source pressure of 14.0 MPa, and high output stiffness for an actuator
- **Reliability**
  Redundant configuration of the oil supply pump in the oil supply system, and two sets of oil pumps mutually reserved
- **Rapidity**
  Dynamic response time < 0.3s, and fast closing time < 0.2s
- **Oil requirement**
  Phosphoric acid grease resistant fuel
- **Maintenance requirement**
  Regular replacement required for short life of the anti-fuel oil, regular testing required for oil quality, filtration, purification, replacement, and maintenance of equipment

Advanced Features

OPC function

To prevent shutdown due to speed fluctuations in small grids, the 103% no action value needs to be masked. The DEH system should add an OPC function for high acceleration to suppress load rejection overspeed. This function detects when the acceleration exceeds a predetermined value. When the speed exceeds a certain threshold, the high acceleration OPC signal is triggered, causing the control valve to close rapidly. Once the speed decreases, the OPC signal is canceled, and control is handed back to the regulation system.

Secondary Frequency Regulation

By changing the setpoint of the frequency regulation unit's speed control system, the output power is adjusted to bring the grid frequency back to the rated value, ensuring stable operation of the grid.

Primary Frequency Regulation

DEH should have a fast and reliable primary frequency regulation function. If the grid frequency deviates from the rated value, the primary frequency regulation function of the unit will automatically control the increase or decrease of the unit's active power, limiting the grid frequency fluctuation, maintaining grid frequency stability, and ensuring the safe operation of the unit.

Decoupling Function

A cogeneration unit provides both power and heat, and there is a certain coupling relationship between the two. Changing the opening of any control valve will affect both the extraction steam flow and the power generation. The decoupling coefficient is calculated based on the unit's thermal balance data to achieve balanced decoupling control of all parameters.

Valve Management

To balance the thermal efficiency and lifespan consumption of the unit, DEH includes a valve management function. Operators can easily choose between single-valve operation or sequential valve operation as needed. This includes the switching between main steam valve control and control valve regulation, linearization correction of valve flow characteristics, generation of sequential valve functions, generation of single-valve functions, coefficient settings, and overall valve position correction, allowing for seamless multi-valve/ single-valve switching.

Simulation Function

When the unit has tripped, DEH can enter simulation mode, simulating various operating conditions and scenarios of the turbine. This simulation mode can replicate most functions such as regulation, protection, and testing. This feature is useful for conveniently debugging configuration software and training on-site personnel. The simulation function of the turbine is significant for improving its performance, reliability, and safety.

LVDT Rod Drop Ditection

In the existing redundant LVDT (Linear Variable Differential Transformer) within the servo loop, if the LVDT core rod fastening nut loosens or completely falls off, leading to a rod drop failure, the faulty LVDT signal may still be used. This could cause the actual actuator stroke to deviate from the set value, potentially leading to fully open or fully closed positions and endangering the unit's safety. The HollySys intelligent servo module introduces an analog actuator integration segment, greatly enhancing the ability to detect LVDT failures and improving the reliability of the servo system.

ATC Function

ATC (Automatic Turbine Control) function of the turbine is a feature for automatic program control. DEH monitors the turbine's status and calculates rotor stress. Within the allowable stress limits of the unit, it optimizes the startup procedure to achieve the fastest and shortest automatic startup, acceleration, and load change. Throughout the startup, shutdown, or load change processes, it performs closed-loop automatic control to keep the rotor stress within permissible limits. During normal operation, the ATC function also provides supervisory capabilities to ensure the safe and stable operation of the turbine.

Advanced Functions

APS Automatic Start-Stop System

The HollySys APS automatic start-stop system can control the turbine generator unit from cold, warm, hot, and very hot states to full load operation, and then from full load operation to safe shutdown. This enables automatic startup and shutdown of the unit, reducing human intervention, lowering the workload of operators, preventing misoperations, and reducing the time required for startup and shutdown, thereby achieving reasonable safety and economic benefits.

The control on the turbine side mainly includes cooling water system, condensate system, lubrication oil system, EH oil system, turning gear system, vacuum system, drainage system, shaft sealing system, bypass system, DEH, ETS, TSI, etc.

The control on the electrical side mainly includes excitation system and synchronization grid connection system.

Remote Expert Diagnosis

Remote expert diagnosis is an efficient and convenient technical means that meets the needs of industrial users for remote monitoring through remote desktop control technology based on video compression transmission. Experts can remotely monitor and diagnose the industrial control systems and other process parameters of an enterprise. This allows for the collection and analysis of monitoring data related to system equipment and plant operation performance, extracting information related to equipment status, performance, and operating conditions, and proposing improvement measures. HollySys can help achieve remote operation monitoring and optimize preventive maintenance work, which not only improves the efficiency and accuracy of fault diagnosis but also helps reduce maintenance costs and shorten fault handling time, thereby ensuring the continuity and stability of the production process.

Intelligent Isolated Grid Coordination System

The HollySys intelligent isolated grid coordination system is a comprehensive energy coordination management system developed for power enterprises. It operates on the same control layer as DCS, DEH, and electrical system, providing fast computational coordination capabilities. The system monitors various information and statuses on both the generation and consumption sides in real time. It unifies the coordination and dispatch of related systems such as DCS, DEH, and electrical systems, enabling the power generation units to work collaboratively. This system meets the requirements of various application scenarios, such as instantaneously isolated grid and completely isolated grid, for power generation enterprises.

Typical Cases

1,000 MW-Level Thermal Power

China Energy Group Yongzhou 2 × 1,000 MW Turbine Unit DEH Project

Advances the Benchmark in the Thermal Power Industry to Seize the High Ground of Ultra-Low Emissions

Project Background

The China Energy Group Yongzhou Phase I 21,000 MW Turbine Unit Project is the first million-kilowatt power unit in Hunan Province. The project is planned to have a total installed capacity of 61,000 MW and has been designated by Hunan Province as an environmental demonstration project for "ultra-low emissions and ecological civilization".

System Application

The turbine regulation system is the HollySys T800K high-pressure fire-resistant oil turbine digital electro-hydraulic control system, providing users with an integrated plant-wide solution. This includes the design, assembly, and commissioning of DCS, DEH, ETS, and other systems. The Phase I project entered commercial operation with the commissioning of two units in 2021.

Waste-to-Energy

Everbright Boluo N25 MW Waste-to-Energy System Project

Smart Technology Achieves Dual Enhancement of Economic and Environmental Benefits

Project Background

Everbright Group is a Fortune Global 500 company. Its subsidiary Everbright Environmental Energy (Boluo) Co., Ltd. has installed N25 MW reheating steam turbine generator units for a waste incineration power generation project in Guangdong Province, China. This project marks the first of its kind at the county level, utilizing high parameters and featuring advanced technologies such as a large grate, high parameter settings, reheating units, and intelligent power plant systems.

System Application

The project adopts the digital electro-hydraulic control system of HollySys T800K high-pressure fuel-resistant steam turbine, and the unit uses intelligent technologies such as the APS automatic start-stop system of the whole plant.

Blast Furnace Gas Power Generation (Reheat Unit)

Fangchenggang Shenglong Metallurgy 145 MW Ultra-Supercritical Unit DEH System Project

Intelligent Manufacturing Helps Set Multiple World Records

Project Background

Shenglong Metallurgy is one of the top 500 enterprises in China and one of the top 50 steel enterprises in the world. In 2021, the world's first 3 × N145 MW supercritical gas generator unit was built. The power generation efficiency of a single unit reaches 43.5%, and the annual power generation capacity is 1.06 billion kWh, which can reduce carbon dioxide emissions by 854 KTA.

System Application

The project adopts the digital electro-hydraulic control system of HollySys T800K high-pressure fuel-resistant steam turbine, and uses intelligent technologies such as APS automatic start-stop system of the whole plant. The unit has refreshed many "world records", such as operating pressure, temperature, and power generation efficiency. This fifth-generation gas generator unit has complete independent intellectual property rights and localized equipment.

Petrochemical Self-Supplied Power Station

Yangzi Petrochemical Green Steam Supply Center 2 × CB50 MW Project

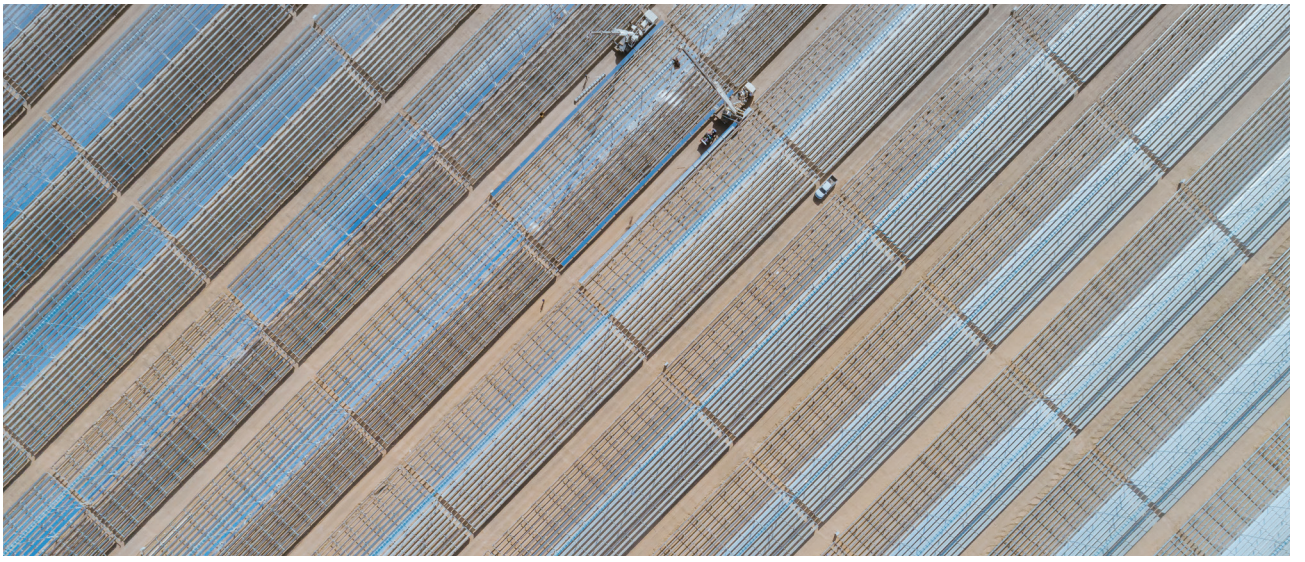
Contributes Cutting-Edge Capabilities to Build World-Leading Clean and Smart Energy

Project Background

The 3 × 540 t/h coal-fired boiler and 2 × CB50 MW steam turbine units of the green steam supply center project of Sinopec Yangzi Petrochemical Co., Ltd. are the key projects for Yangzi Petrochemical to accelerate the transformation of energy structure, optimize energy consumption structure, and help realize carbon peaking and carbon neutrality with green and low-carbon development.

System Application

The project launched a 2 × CB50 MW extraction-back steam turbine generator set, which adopts the digital electro-hydraulic control system of HollySys T800K high-pressure fuel-resistant steam turbine. It includes the design, complete set, and commissioning of DCS, DEH, ETS and other systems, which fully considers the characteristics of the extraction steam heating units and meets the heating and power generation needs, significantly improving the economy and reliability of the units.



Concentrated Solar Power

Lanzhou Dacheng Dunhuang N50 MW Molten Salt Linear Fresnel CSP DEH+ETS Project

New Energy Demonstration Aids in the Achievement of Carbon Peaking and Carbon Neutrality

Project Background

Lanzhou Dacheng Dunhuang N50 MW molten salt linear Fresnel solar thermal power generation demonstration project is the world's first commercial molten salt linear Fresnel solar thermal power generation project. In September 2016, it was successfully selected as the first batch of domestic solar thermal power generation demonstration projects. The planned installed capacity of the project is 50 MW. The power station has linear Fresnel concentrating solar thermal technology with independent intellectual property rights, and uses molten salt as a unified medium for heat collection, heat transfer and heat storage, which can turn intermittent solar energy into a basic energy source for continuous output. It is a revolution in the energy production process.

System Application

HollySys is responsible for the design, complete set, supply and commissioning of DEH and ETS. It takes only 18 days from the commissioning of the project with salt to the overall operation of the system for power generation, which proves that the linear concentrating solar thermal technology with molten salt as the heat collection medium has good technical advantages. The system was officially put into commercial operation in June 2020.

Combined Cycle Power Generation

Guangzhou Development Conghua Pearl Natural Gas Distributed Energy Station Project

Propels the Power Industry Towards a New Era of Stability, Reliability, and Self-Control

Project Background

The project is a 2 × 40 MW gas-steam combined cycle unit, which is a triple cogeneration unit. As the first demonstration application of major technical equipment for the localization of gas turbine generators for distributed energy, this project can effectively break the market monopoly of foreign manufacturers in the supply of distributed energy core equipment, establish independent production and maintenance capabilities for core equipment, and drive domestic development of heavy-duty gas turbines in the field of distributed energy, thereby realizing the independent controllability of control system software and protection logic configuration technology.

System Application

The entire combined cycle unit and its auxiliary system of the whole station adopt integrated configuration. The TCS of the gas turbine, the DCS, DEH, and ETS of the waste heat power generation and other auxiliary systems all adopt HollySys independent products and have grid dispatching AGC and qualified primary frequency regulation capabilities. The project was officially put into commercial operation in 2023.

Isolated Grid Coordination Control in High-Altitude Remote Areas

Ngari Regional Urban Investment Combined Heat and Power DEH + Isolated Grid Stability Control Project

Reliable and Efficient Solutions for Stable Power and Heat Supply

Project Background

Ngari Shiquan River Cogeneration Central Heating Project is in Zhunge'er County, the core area of the Qiangtang Plateau in the north of the Qinghai-Tibet Plateau, with an installed capacity of 2 × 6 MW. This project is important to ensure the safe and stable operation of central heating in Ngari Area.

System Application

The project adds a new set of intelligent isolated grid coordination system master station and a fault resolution unit, which cooperates with DEH, DCS and excitation system and synchronization device to form a complete set of intelligent isolated grid coordination system. The project completed construction, commissioning and isolated grid test in October 2020, and was officially put into operation.

DEH Retrofitting

Datang Luohe Domestic System DEH Retrofitting Project

Supports Large Coal-Fired Power Plants in Control System Retrofitting

Project Background

Datang Luohe Power Plant is one of the main power plants in East China Power Grid. The installed capacity of the third phase is 2 × 630 MW, and the unit was put into operation in January 2008. Among them, the DCS, DEH, and MEH adopt ABB Symphony system, the ETS adopts ABB PLC, and the METS adopts Schneider PLC. They are all imported control systems. The equipment is seriously aging, the system failure rate is high, and the operation and maintenance of the non-integrated system are inconvenient, accompanied by the energy security risk and the risk of spare parts procurement of the imported system.

System Application

All control systems are transformed into HollySys control systems to realize integrated control of DCS, DEH, ETS, MEH, METS and other systems. In January 2022, the unit will be successfully put into operation with rated load. The smooth operation of the transformation project is the perfect integration of chips, databases, operating systems, industrial software, automation technology in the independent industrial field and large-scale thermal power industry technology, getting rid of the dependence of the core technology of domestic industrial control systems on foreign countries, and marking HollySys HOLLiAS MACS IC DCS, has been successfully applied in ultra-supercritical thermal power units above 600 MW.

Services

Sincerely thank you for choosing HollySys products. While providing you with advanced products, we also hope to bring you industry-class system-level full lifecycle services. Service guarantee includes ensuring the stable operation of the system, providing continuous support, and effectively responding to potential risks. Our services mainly include the following:

- **Stable operation**
  The system must be able to operate stably for a long time to eliminate system failures or performance problems in a timely manner. This usually requires regular system maintenance, updates and monitoring, and timely troubleshooting and repair.
- **Technical support**
  Technical support is offered for the whole journey before and after sales, including online help, telephone support, remote assistance, etc., to solve problems existing in users' system operation.
- **Training guidance**
  Necessary training services are provided to help users better understand and use the system, and improve user experience and satisfaction.
- **Hardware maintenance**
  Hardware spare parts can be maintained regularly.
- **Software application**
  The software can be updated regularly.
- **Upgrading**
  Flexible upgrading service solutions are offered to meet operating environment and ensure stable operation needs.
- **Renovation**
  Various upgrading needs of customers can be met, helping achieve the long-term goal of sustainable development.

Typical References

SN.	End User	Unit Number	Number of Turbine Plant Sets
1,000 MW Units (22 Sets)			
1	Shenhua Fujian Shishi Hongshan Cogeneration Plant Phase II	3#, 4#	Dongfang Turbine Co., Ltd. 10 sets
2	Sichuan Shenhua Tianming Power Generation Co., Ltd.	1#, 2#	
3	Shenhua Guohua Yongzhou Power Generation Co., Ltd.	1#, 2#	Harbin Turbine Company Limited 6 sets
4	Gansu Power Investment Changle Power Generation Co., Ltd.	3#, 4#	
5	Chang'an Yiyang Power Generation Co., Ltd. Phase III	5#, 6#	Shanghai Turbine Co., Ltd. 6 sets
6	Gansu Power Investment Zhangye Power Generation Co., Ltd.	3#, 4#	
660 MW Unit (50 Sets)			
1	Inner Mongolia Guohua Hulun Buir Power Generation Co., Ltd. (Air-cooled)	1#, 2#	Shanghai Turbine Co., Ltd. 16 sets
2	Xinjiang Henglian Wucaiwan Power Plant	1#, 2#	
3	Datang Pingluo Power Generation Co., Ltd. (Bus)	1#, 2#	
4	Datang Huayin Youxian Energy Co., Ltd.	5#, 6#	Harbin Turbine Company Limited 16 sets
5	Ningxia Guohua Ningdong Power Generation Co., Ltd.	3#, 4#	
6	Shenhua Shendong Xinjiang Zhundong Wucaiwan Power Generation Co., Ltd.	3#, 4#	
7	Guangdong Shaoguan Yuejiang Power Generation Co., Ltd.	1#, 2#	Dongfang Turbine Co., Ltd. 18 sets
8	Guizhou Qiangui Power Generation Co., Ltd. Panxian Power Plant	1#, 2#	
9	Xinjiang Oriental Hope New Energy Co., Ltd.	1#, 2#, 3#, 4#	
10	Inner Mongolia Energy Power Generation Investment Group	3#, 4#	
380 MW Units (23 Sets)			
1	PT. Tsingshan Steel Indonesia	3#, 4#, 5#, 6#, 7#, 8#, 9#, 10#, 11#	Shanghai Turbine Co., Ltd. 15 sets
2	PT.OBI SINR TIMUR	1#, 2#, 3#, 4#	
3	PT. KALTARA POWER INDONESIA	3#, 4#	
4	PT. Tsingshan Steel Indonesia	7#, 8#, 9#, 10#, 11#, 12#, 13#, 14#	Dongfang Turbine Co., Ltd. 8 sets
350 MW Units (6 Sets)			
1	PT. Tsingshan Steel Indonesia	5#, 6#	Dongfang Turbine Co., Ltd. 4 sets
2	PT. Shenhua Guohua Lion Power Indonesia	1#, 2#	
3	PT. Tsingshan Steel Indonesia	1#, 2#	Shanghai Turbine Co., Ltd. 2 sets

SN.	End User	Unit Number	Number of Turbine Plant Sets
300 MW Units (216 Sets)			
1	Guohua Guangtou (Liuzhou) Power Generation Co., Ltd. Luzhai Power Plant	1#, 2#	Harbin Turbine Company Limited 61 sets
2	Binzhou Zhanhua District Huihong New Material Co., Ltd.	1#, 2#	
3	Huaneng Shaanxi Weinan Thermal Power Co., Ltd.	1#, 2#	
4	Liaoning Shenmei Hongyang Thermal Power Co., Ltd.	1#	
5	China Coal Pingshuo Antaibao Thermal Power Co., Ltd.	1#, 2#	
1	Liaoning Datang International Huludao Thermal Power Company Limited	1#, 2#	Dongfang Turbine Co., Ltd. 63 sets
2	Indonesia Tsingshan Stainless Steel Co., Ltd. Thermal Power	5#, 6#	
3	Huaneng Power International, Inc. Dezhou Power Plant	1#, 2#	
4	North United Power Baotou No.2 Thermal Power Plant	3#, 4#	
5	Shandong Huawang Thermal Power Co., Ltd.	1#, 2#	
1	Shenhua Guohua (Indonesia) Tianjian Meilang Power Generation Co., Ltd	1#, 2#	Shanghai Turbine Co., Ltd. 50 sets
2	Jingneng Qinhuangdao Thermal Power Co., Ltd	1#, 2#	
3	Huaneng Liaocheng Thermal Power Co., Ltd	7#, 8#	
4	Huaneng Jining Canal Power Generation Co., Ltd	5#, 6#	
5	Indonesia Qingshan Stainless Steel Co., Ltd. Huaqing Aluminum	1#, 2#, 3#, 9#, 10#	
1	Shandong Zouping Changshan Cogeneration Plant	1#, 2#, 3#, 4#	Nanjing Turbine & Electric Machinery (Group) Co., Ltd. 27 sets
2	Shandong Weiqiao No. 1 Power Plant	1#, 2#, 3#, 4#	
3	Shandong Huimin New Material Co., Ltd. Thermal Power	1#, 2#, 3#, 4#	
4	Yangxin County Binbei New Material Co., Ltd.	1#, 2#, 3#, 4#	
5	Huimin Huji Power Plant	1#, 2#, 3#, 4#	
1	TRN Energy Pvt Ltd	1#, 2#	Beijing Beizhong Steam Turbine Generator Co., Ltd. 15 sets
2	Xinjiang Nongliushi Coal and Electricity Co., Ltd.	1#, 2#, 3#, 4#	
3	Eping Xinyuan Aluminum Co., Ltd. Haoji Power Plant	1#, 2#, 3#	
4	Xinjiang Qiya Aluminum & Power Co., Ltd.	1#, 2#	
5	Datang Yan'an Power Plant (Bus)	1#, 2#	

SN.	End User	Power	Number of Turbine Plant Sets
1.5 MW to 300 MW Units (About 6300 Sets)			
1	Xinjiang Tianlong Mining Co., Ltd.	200 MW	Dongfang Turbine Co., Ltd. 607 sets
2	PT. Tsingshan Steel Indonesia	150 MW	
3	PT.Dexin Steel Indonesia	150 MW	
4	Tangshan Jiahua Coal Chemical Co., Ltd.	135 MW	
5	Pan'gang Group Panzhihua Steel Vanadium Co., Ltd.	110 MW	
6	PT.Dexin Steel Indonesia	100 MW	
7	Ezhou Echeng Steel Co., Ltd.	80 MW	
8	PT. Tsingshan Steel Indonesia	65 MW	
1	PT. GH EMM Indonesia	150 MW	
2	PT. Halmahera Jaya Feronikel	150 MW	
3	PT. Obi Sinr Timur	150 MW	
4	PT. Kaltara Indonesia	150 MW	
1	Shanghai Dingxin Investment (Group) Co., Ltd.	250 MW	Shanghai Turbine Co., Ltd. 354 sets
2	Anhui Suzhou Huiyuan Electric Heating Co., Ltd.	125 MW	
3	Shanghai SIIC Baowu Jin'gang Environmental Resources Technology Co., Ltd.	60 MW	
4	Chengfa Environmental Energy (Huaiyang) Co., Ltd.	18 MW	
1	Chiping Xinfa Huaxing Chemical Co., Ltd.	155 MW	Wuhan Turbine Generator Co., Ltd. 1,100 sets
2	Shenhua Wuhai Energy Co., Ltd.	135 MW	
3	Cangzhou Risun Chemical Co., Ltd.	60 MW	
4	Jingmen Xinjian Yangfeng China Phosphate Fertilizer Co., Ltd.	12 MW	
1	Shenmu County Clean Energy Comprehensive Utilization Co., Ltd.	55 MW	Qingdao Jieneng Steam Turbine Group Co., Ltd. 1,800 sets
2	Shandong Yucheng Xinjianyuan Thermal Power Co., Ltd.	30 MW	
3	Henan Zhonghong Group Coal Chemical Co., Ltd.	25 MW	
4	COFCO Sugar Liaoning Co., Ltd.	12 MW	

SN.	End User	Power	Number of Turbine Plant Sets
1	Shandong Weiye Thermal Power City Heating Center	200 MW	Nanjing Turbine & Electric Machinery (Group) Co., Ltd. 402 sets
2	Shandong Weiqiao Group Co., Ltd.	135 MW	
3	PLTU Sumatera Barat 2×110MW	110 MW	
4	Nine Dragons Paper Industries (Shenyang) Co., Ltd.	50 MW	
1	Myanmar Kyaukpyu Power Generation Co., Ltd.	50 MW	Hangzhou Turbine Power Group Co., Ltd. 450 sets
2	Fujin Xiangyu Jingu Biochemical Technology Co., Ltd.	40 MW	
3	Jiangxi Five Star Paper Co., Ltd.	18 MW	
1	Pingyin Shanshui Cement Co., Ltd.	155 MW	Hangzhou Zhongneng Turbine Generator Co., Ltd. 350 sets
2	Heilongjiang Zhongxin Thermal Power Co., Ltd.	40 MW	
3	Harbin Changheng Bio-based Materials Co., Ltd.	30 MW	
4	Hanlan Engineering Technology Co., Ltd.	12 MW	
1	Everbright Environmental Protection (China) Limited	60 MW	Guangzhou Guangzhong Enterprise Group Co., Ltd 350 sets
2	Everbright Environmental Energy (Xinyang) Limited	35 MW	
3	Everbright Environmental Energy (Ningyuan) Limited	25 MW	
4	Zhejiang Weiming Environmental Protection Co., Ltd.	15 MW	
1	Yuncheng Guanlu Thermal Power Co., Ltd.	210 MW	Beijing Beizhong Steam Turbine Generator Co., Ltd. 352 sets
2	Shenmu Calcium Carbide Group Energy Development Co., Ltd.	150 MW	
3	PLTU Kaltim - Teluk Balipapan	110 MW	
4	Tangshan Sanyou Chemical Co., Ltd.	30 MW	
Others		< 10 MW	About 150 sets

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