HOW TO POWER THE WORLD

Our planet is calling for affordable, sustainable, highly reliable and clean power. Together we can achieve it.

Power grows when we all work together.

Today, one in six people around the world lives without reliable access to electricity, while global demand for power continues to grow. The mission of Mitsubishi Hitachi Power Systems, Ltd. (MHPS) is to address these needs by providing more affordable, highly reliable and cleaner energy solutions.

MHPS was born through the merger of the thermal power generation divisions of Mitsubishi Heavy Industries, Ltd. and Hitachi, Ltd. in 2014. Based on our parent companies’ long histories of product development and supply for more than a century, we have been dedicated to designing, manufacturing, delivering, installing and providing support services for a wide range of proprietary power generation systems.

One of our products is the gas turbine, the engine of gas turbine combined cycle (GTCC) power plants, which provides incredibly efficient electric power while reducing greenhouse gas emissions. We also provide next-generation power systems, such as integrated coal gasification combined cycle (IGCC) power plants, steam power plants, geothermal power plants, air quality control systems (AQCS) and digital solutions. MHPS TOYOBO, Inc. will continue our mission to address power needs by developing technologies that enhance the global environment and provide affordable, sustainable, reliable power for the planet.

Power for a Brighter Future
Steam Power Plants

MHI's designs and delivers highly efficient and environmentally friendly power generation facilities, including boilers, steam turbines, and generators.

Integrated Customer Service
From Design to Delivery of an Entire Power Generation Facility

Co-generation Power Plants
Effective use of electricity and steam

What is a steam power plant?

A steam power plant consists of a boiler, a steam turbine, a generator, and other auxiliaries. The boiler generates steam at high pressure and high temperature. The steam turbine converts the heat energy of steam into mechanical energy, through proper integration of all equipment. MHI's designs and delivers highly efficient and environmentally friendly power plants.

Large Capacity Power Plants

Applying ultrahigh pressure technology for highly efficient power generation.

MHI’s has aggressive track record in the field of ultrahigh pressure and ultrahigh pressure supercritical power plants and has achieved a high level of trust in the market for its high efficiency and reduction emission of its boilers, catalyzing an successful operating experience with the advanced technology. MHI will continue to contribute to the stable and high-reliability electric power (skill), in improving the environmental management.

What is ultrahigh pressure plants?

Under normal operating pressure (320 kg/cm²G), water boil at 100°C. As the pressure increases, so does the boiling temperature of water. When the pressure is increased to 2225 kg/cm²G, water can boil at 530°C. Without the intermediate heating stages, this is called the critical point, and the pressure above the critical point is called supercritical pressure. Supercritical pressure, even higher than 320 kg/cm²G, is called ultrahigh pressure.

Integrated Customer Service

Supplying power plants matching customers’ needs.

As an EPIC contractor, MHI offers turnkey products, design, and installation of power plants, from main plant equipment to auxiliary air quality control systems. MHI can incorporate the complete plant system to optimize equipment design and efficiency. Main power equipment, such as boilers, steam turbines and generators, is custom designed to meet customer needs, when added to an existing power generation system. MHI will work closely with existing plant equipment and optimize to meet the specified requirements.

Cogeneration Power Plants

Fusing the many faces of energy.

In some industrial applications, excess energy is generated apart from the main operating process. In some cases, the energy produced is economically portable, another option is to utilize the free source of energy to produce steam and electric power. Either of含式 energy or fuel for the generation of steam and electricity is called cogeneration, when combined and properly integrated with the total system, power quality and efficiency improves, and impacts to the environment are minimized.
Manjung 5 — One of the world’s most advanced power plants

Mitsui Power Systems (MPS) provided ultra-supercritical 660 MW steam turbines and cross gas pipes for a 1,660 MW power plant in Malaysia. The project was delivered on schedule and to exacting specifications, demonstrating MPS’ expertise in delivering large-scale, high-technology power plants.

The project consisted of two 1,660 MW units, each capable of generating 1,660 MW and serving the electricity needs of Malaysia. MPS’ advanced turbine technology enabled the plant to operate efficiently and reliably, contributing to the country’s energy security.

MPS has a strong track record in the field of advanced power generation, providing turnkey solutions to a wide range of customers around the world. The Manjung 5 project is a testament to MPS’ commitment to delivering high-quality, reliable power plants that meet the needs of its customers.

**Project Details**

**Mitsui Power Systems (MPS)**
- **Location:** Malaysia
- **Capacity:** 1,660 MW (2x830 MW)
- **Output:** 1,660 MW
- **Status:** In operation

**Customer:**
- **Name:** Malaysian Independent Power Producer
- **Location:** Malaysia
- **Date:** September 2017
- **Units:** 2x830 MW

**Description:** The Manjung 5 project is a joint venture between MPS and its local partner, Malaysia’s leading independent power producer. The project was completed on time and within budget, demonstrating MPS’ capability to deliver high-performance power plants.

**Key Highlights:**
- **Ultra-supercritical technology**
- **Reliability and efficiency**
- **Contribution to Malaysia’s energy security**

MPS is committed to delivering advanced power plants that meet the needs of its customers, contributing to sustainable energy solutions around the world.
Stein Turbines

Contribution to power generation globally: more than a century.

Development history:

Steam Turbines from the 19th century to the present, providing efficient and reliable steam turbines that have undergone steep increases in efficiency, reliability, and efficiency.

Flexible Configurations

Option to choose steam turbine.

High-Efficiency Steam Turbines

Up to 250 MW

High steam turbine efficiency and reliability:

Flexible steam turbine for industrial applications, large steam turbine for power plants, and gas turbine power plants.

Development history:

High steam turbine efficiency and reliability:

Flexible steam turbine for industrial applications, large steam turbine for power plants, and gas turbine power plants.

Up to 1,200 MW

Development history:

High steam turbine efficiency and reliability:

Flexible steam turbine for industrial applications, large steam turbine for power plants, and gas turbine power plants.

In addition, as a single unit or in multiple units, the steam turbine can be a compact unit, increasing the number of components and reducing the area for installation. The high pressure, intermediate pressure, and low pressure sections can be connected with a single shaft. The compact design of the steam turbine reduces the space required for installation and maintenance. A smaller number of components and areas reduce time for maintenance and operations.

Specifications

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<tr>
<th>Steam Turbine Specifications</th>
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<td><strong>Model</strong></td>
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Power plants:

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<td><strong>Technology</strong></td>
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In conclusion, steam turbines are crucial in providing efficient and reliable power generation. The development of steam turbines has continuously improved, leading to more efficient and reliable power plants.
Boilers

MNPS supplies boilers that boast world-leading quality and performance based on stable quality developed over many years and state-of-the-art technologies.

In 1969

Available in two types: supercritical and subcritical boilers.

More than

5,500 units delivered

Power Plant Cost

Tower Boiler

Optimized for Various Types of Coal

Low-NOx Burner Technology

Optimal 
for 

In a supercritical boiler, to ensure reliability of the furnace area, a steam drum is an essential unit that continues to deliver adequate water to the supercritical drum, which delivers steam and hot gas to power generation equipment.

Types of coal

Various types of coal are used, from anthracite with its high carbon content to low-sulfur coal with medium carbon content.

In a subcritical boiler, cooperation with energy companies in long-term contracts.

Technical advantages

- High performance
- Excellent fuel flexibility
- Low NOx and SOx emissions
- Advanced design based on experience with similar systems
- Emissions lower than the current EU standards
- Emissions lower than the current EU standards
- Furnace design for the highest possible overall thermal efficiency and full load performance with low NOx and SOx emissions.

Specifications

- Boiler rating 400 MW
- Steam pressure: 325 bar or 350 bar
- Steam temperature: 600°C
- Fuel: Coal
- boiler efficiency: 90.5%
- Boiler life: 50 years

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Bubbling Fluidized Bed (BFB) Boilers

A bubbling fluidized bed (BFB) boiler is a boiler that can handle fuel that is difficult to burn or is of poor quality. The fuel is introduced into a mixture of sand or gravel and hot air, which is called the fluidized bed. The fuel is added to the bed in a controlled manner, and the bed is then ignited to initiate combustion. The bed is then maintained at a constant temperature, and the fuel is added in a controlled manner to maintain the bed at the desired temperature.

Chemical Recovery Boilers

A chemical recovery boiler is a type of boiler that is used in the pulp and paper industry to recover chemical energy from waste wood. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy.

Combustion protection

With a chemical recovery boiler, the furnace walls and associated tubes are exposed to a high-temperature environment, which can be corrosive to the furnace walls and associated tubes. The corrosion protection is achieved by using a combination of high-temperature steam and high-temperature water to generate energy. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy.

Low environmental impact

As BFB boilers use the same combustion and heat recovery units as conventional fired boilers, the boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy. The boiler is designed to recover chemical energy from waste wood by using a combination of high-temperature steam and high-temperature water to generate energy.

Technical Information

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Combustion test facility

The furnace walls and associated tubes are exposed to a high-temperature environment, which can be corrosive to the furnace walls and associated tubes. The corrosion protection is achieved by using a combination of high-temperature steam and high-temperature water to generate energy.

1. Functions as an atmospheric melt combustion apparatus in a vertical setup
2. Functions as a wide range of test combustion apparatus in a vertical setup
Air Quality Control Systems (AQCS)

MIPS is the world’s only company able to develop its own technology for AQCS, including SCR, FGD and ESP, and is capable of designing the total AQCS area to meet customer commercial and environmental needs.

High-efficiency ESP

We have developed a new flue gas treatment system, consisting of ESP, electrostatic precipitators, and venturi air blower (VAB), which achieves effective treatment of the flue gas. It can control dust emissions within the scope of regulatory standards. Furthermore, based on a large amount of condition control research, we can control ESP to meet the requirements of various industries. With the stable operation of the ESP, the dust removal efficiency of ESP can be improved.

Selective Catalytic Reduction (SCR) System

MIPS selects catalytic reduction (SCR) systems on the basis of the performances of power plant boilers and other combustion sources. By selectively reducing NOX, MIPS has developed advanced SCR systems that satisfy the global demand for managing NOX emissions.

Mercury control mechanisms

Step 1: Injection of mercury using SCR catalytic
Step 2: Absorption and neutralisation of mercury on adsorbents, ESP and ESP flue gas treatment system (FGD)
Step 3: Controlled absorption of mercury (high load) at flue FGD

Major mercury control methods and technologies

- Mercury Injection Catalytic (MIC)
- High Adsorption Catalytic (HAC)
- MIPS proprietary catalytic technology for the oxidation and reduction of NOX, and reduces NOX levels below 50-100 ppm.
- Technology for preventing mercury in system
- Our Sulphur Dioxide Control System prevents the emission of mercury in the system, which is then released into the environment.

Flue Gas Desulphurisation (FGD) Plant

MIPS has been providing FGD plant equipment to major coal-fired power plants in China. MIPS has been able to provide a full range of FGD systems for various plants, including ESP, FGD, and ESP-FGD systems, which can satisfy the needs of various industries.

Electrostatic Precipitators (ESP)

MIPS electrostatic precipitators (ESP)ollen in dust in the flue gas produced by boilers and other combustion sources to meet air pollution control and environmental standards of thermal power plants, steel mills, and various other industrial plants.

Basic advantages of ESP

1. High efficiency in dust collection, generating a dust-free discharge that fulfills pollution standards.
2. The electrostatic precipitator is installed at the outlet of the stack, which avoids the collection of dust from the stack.
3. The accumulated dust is removed by being removed by hopper, enabling dust-free operation, and satisfying environmental standards.
Boilers

Oxidizing pressure parts

Over program operations, the reliability of boiler pressure parts demands and the viability of the entire plant borrows. MPS has developed oxidizing maintenance (MOM) procedures using inspection results on each part of the boiler to determine weak points of pressure parts and highly introduced altered maintenance programs based on these results. For deteriorating boilers, we have recommended that customers use the NWP procedures in order to reduce any unexpected shutdowns.

High performance burner replacement

Through technology advancement, MPS has high-performance burners that deliver lower NOx emissions and bio-advanced mud that improve burner performance. These high-performance burners supply environment-friendly flames and are applicable to a wide variety of fuel. MPS provides both conventional and advanced technologies to meet diversified customer needs.

High performance waterwall replacement

In order to meet the coal specifications and to optimize combustion, MPS offers equipment for pulverized boilers. MPS’s high-performance waterwall offers outstanding pulverization and classifications, helps a wide range of coal, and provides lower unburned carbon and higher rates of thermal efficiency.

Special inspection technologies (Cathodic Discharge inner NWP)

For furnace evaporator tubes, it is very difficult to inspect tube bores. MPS offers the WIF system for these invisible holes, to prevent a spallation through the tube. Thickness can be measured along the tube length of evaporators and other heat exchanger tubes.

Steam Turbines

Steam turbine retrofit through application of blanket technology

The occurrence of performance expiration and various other problems reduces steam turbines as a result of operating time estimations are caused by steam and leakage damages over a period of operation. MPS proposed for blanket retrofit projects, such as steam turbine replacement and parts supply, have been adopted and implemented by many customers worldwide.

Steam turbines are highly sophisticated and complex equipment that are the heart of the plant. The reliability and efficiency of steam turbines are critical to the overall performance of power plants. Over the years, various retrofit projects have been implemented to improve the performance, availability, and efficiency of existing steam turbines. MPS offers a comprehensive range of services for steam turbine retrofits, including repairs, upgrades, and performance enhancements.

Overhauling of retrofits and additional parts

MPS strives to ensure that the construction period for blanket retrofit projects is as short as possible, while emphasizing the availability of the steam turbines. For example, the shortening of the construction period of steam turbines by using 3D measurement technology, these CHP models are based on precise measurements of existing parts to be replaced, such as the outer casing, Possible surface of internal inspections can be detected with the already measured IG model of the inner stamp and quick construction work is carried out through the execution of necessary fine adjustments in advance.

MPS technical training

MPS technical training center

The MPS Technical Training Center was established in July 2017 with the aim of systematic training engineers to take on new field work. Various technical courses, technical training for steam turbines and associated equipment of power plants, and various practical training using actual machinery and equipment that were installed at the power plant. This training center aims to deliver engineers who can provide technical services to customers through realistic quality and peace of mind of employees.
Remote Monitoring Centers

Remote Monitoring Centers (RMCs) have been established jointly by the utilities and their regional operators, and maintenance services are available under operating conditions under a common system. The system aims at minimizing the costs of maintenance and improving the efficiency of the utilities. The RMCs are equipped with the latest technology and provide 24/7 monitoring of the plants and their operating parameters.

Long Term Service Agreement for Power Plants

MHPs provide customized solutions to utilities which enable operators to achieve the desired level of power availability and efficiency. The agreements include the following:

- Support and maintenance to maintain the best-in-class operations and maintenance of the power plants.
- Remote monitoring of the power plants, ensuring optimal performance.
- Training and support to the operators.
- Regular audits of the power plants to ensure compliance with the standards.

Solutions to Improve Operation Flexibility

Increasing network and economic pressures require flexible operation for power projects. MHPs has developed various programs for coalfired power plants. These programs help in improving the efficiency of the plants and reducing costs.

Comprehensive Maintenance

MHPs provides comprehensive maintenance services to power plants. The services include the following:

- Regular maintenance and inspection of the power plants.
- Assistance in the performance of tasks such as asset management, performance monitoring, and performance improvement.
- Training and support to the operators.

Training Services for Operators

Training services are provided to the operators to ensure that they are well-equipped to operate and maintain the power plants. The services include:

- Classroom training
- On-the-job training
- Online training

MHPs-TOMONi

MHPs-TOMONi is an advanced digital platform that enables the operators to monitor and control power plants. The platform provides real-time data and insights to the operators, helping them to make informed decisions.

A Great Start for New AI Combustion Tuning System

In collaboration with leading technology partners, MHPs is developing an advanced AI combustion tuning system. The system is designed to optimize the performance of the power plants, leading to improved efficiency and reduced emissions. The system will be implemented in a phased manner, starting with the most critical units.

Conclusion

MHPs is committed to providing innovative solutions to the power industry. The company is dedicated to helping utilities and their operators to achieve their goals and improve their performance.