STEAM BOILERS

THE TAGANROG BOILER-MAKING WORKS KRASNY KOTELSHCHIK
COMPANY MISSION

To provide reliable and efficient integrated solutions to meet the needs of the global energy system ever-improving in the technologies and business processes.

COMPANY VISION

To be ranked first in the power market in Russia and the CIS and to be a key player in the global market.

CORPORATE VALUES

CUSTOMER ATTENTION
EFFECTIVENESS AND EFFICIENCY
INNOVATION
SAFETY
TEAMWORK
RESPECT FOR PEOPLE

Power Machines is the largest power engineering company in Russia, with international experience and competence in engineering design, manufacturing and complete delivery of equipment for thermal, nuclear, gas turbine and hydraulic power plants.

Power Machines creates effective complex projects for global power industry relying on the sesquicentennial experience in the company business assets and applying the state-of-the-art developments in science and technology.

The equipment manufactured and supplied by enterprises of the company is in operation in 57 countries all over the world. At the present the equipment total installed capacity is 300,000 MW.

57 COUNTRIES
have operating equipment supplied by the facilities of Power Machines

65% IS A COMPANY SHARE OF
the Russian and CIS market

OVER 300 GW –
is the aggregate capacity of the equipment, manufactured by the company
The Taganrog Boiler-Making Works Krasny Kotelshchik (TKZ), a member of the Power Machines group of companies, is one of the leading Russian boiler-making companies, which has an international experience and competence in design, manufacture and complete delivery of equipment for the power industry.

The products of Krasny Kotelshchik rightfully enjoy the well-deserved recognition of consumers, including in such responsible field, as the nuclear power generation industry. The Quality Management System of the company is certified for compliance with the requirements of the international standard ISO 9001 and the American Society for Mechanical Engineers (ASME).

PJSC Krasny Kotelshchik stands for:

- **BOILER EQUIPMENT INSTALLED AT EVERY SECOND POWER PLANT IN RUSSIA AND THE CIS**
  TKZ is the largest supplier of the boiler equipment for power plants and generating facilities of other energy-intensive industries (metallurgy, gas and oil refining, chemistry).

- **RELIABLE SUPPLIER OF THE HI-TECH SOLUTIONS**
  Thousands of foreign and domestic references including one as an EPC-contractor for new construction and retrofit projects.

- **POWERFUL DESIGN CENTRE, MODERN 3D-DESIGN SYSTEMS**
  The company consolidates the experience of two Local schools of the boiler construction and has the ability to attract international manufacturers for the development and implementation of innovative technologies.

- **MORE THAN 100 YEARS IN THE MARKET OF POWER-PLANT ENGINEERING**
  Highly professional team, vast experience in manufacture, in-house unique designs, high quality of the project implementation.

**Key Competence in Engineering and Manufacturing:**

- **Solid Fuel Technology**
  - Pulverized-coal sub/supercritical
  - CFB (joint technology)

- **Combined-Cycle Technology**
  - Combined-Cycle Plant (CCP) with or without post combustion
  - CCP with GT gas exhaust

- **Pipeline Technology**
  - Pipeline fittings for Gazprom and Transneft

- **Gas/Oil Technology**
  - Gas-fuel oil sub/supercritical
  - Metallurgical gas combustion

- **Heat-Exchange Technology**
  - Heat-exchange equipment for TPP and NPP
  - Water purification equipment

- **Biomass Technology**
  - Pellets, husks, straw and waste wood

The production structure of Krasny Kotelshchik is unique in its capabilities and includes units that are typical for the large power engineering enterprise. Production units are grouped under four technological features, which allows for implementing full manufacturing cycle of the equipment, with regard to the customer’s needs.
The Taganrog Boiler-Making Works Krasny Kotelshchik is a leading supplier of Once-Through Supercritical (SC) Boilers for Power Units 1200, 800, 600, 300 MW for large-scale power plants in Russia and worldwide. In terms of the basic reliability and economical operation indicators, these Boilers suit the modern age, which is confirmed by the decades of experience in their operation, domestic and foreign customer feedback, and researches of the specialized organizations.

Considering decades of experience in the SC Boiler business, Krasny Kotelshchik can make developments and complete delivery of the Supercritical Boiler equipment of any capacity and for any fuel.

The state-of-the-art Boilers of Krasny Kotelshchik meet the latest modern requirements: in particular, they provide operation and startup of the power units at sliding parameters. The equipment represents a simple design, maturity and reliability of the technical solutions. These are high-tech Boilers equipped with the high efficiency burner devices and having technical and economic environmental values on a world-wide basis.
CLASSIFICATION

Steam Boilers for subcritical power units under 660 MW and with steaming capacity between 50 and 2000 tons of steam per hour.

Steam Boilers for Supercritical Power Units from 300 to 1200 MW and with steaming capacity between 900 and 3950 tons of steam per hour.

Boiler Plant for 225 MW Power Unit

Boiler for 600 MW Power Unit

Boilers for burning different kinds of biomass (wood chips, straw and husk pellets) with various steaming capacity.

Biomass Boiler (wood waste)
(dimensional drawing and photo)
MAIN FEATURES AND ADVANTAGES OF STEAM BOILERS PRODUCED BY Krasny Kotelshchik

Krasny Kotelshchik has a significant amount of experience in the design and operation of Boilers running on such kinds of fuel which are traditionally considered as “hard”, including anthracite/anthracite culm, Ekibastuz coal and brown coals.

The high technical level of the Boiler design is provided by:

- involvement of Krasny Kotelshchik specialists in testing and commissioning of boilers and parts, inspection of equipment directly at power plants;
- hydraulic, aerodynamic, and strength tests of prototypes of the critical items on the workshop benches;
- aerodynamic analysis of physical models;
- 3d geometrical modelling of different boiler systems;
- multiversion calculations including mathematical modelling and design analysis aided by the supercomputer.

The boiler equipment designed for thermal power plants has the following advantages:

- high efficiency and potential to achieve the higher efficiency;
- elaborate design basis allows manufacturing and supply of high pressure (HP), supercritical and ultra supercritical boilers of the initial parameter level;
- capability for further development of the advanced trends (CFB and other boilers) in combination with other technologies (CCP, IGCC);
- proven process and resource base (steels, tubes, forgings) allows the manufacture and supply of the HP, supercritical, and ultra supercritical boilers with further development of feasible areas;
- reduced environmental emissions due to the process solutions based on the upgraded boiler design;
- integrated approach ensures improvement of every module of produced steam boilers, the main part of steam turbine units, which results in higher effectiveness and reduced power unit demand;
- capability for further growth in the unit capacity of steam boilers, power units and thermal power plants as a whole;
- potential for use of the new combustion technologies and other boiler processes;
- potential for use of boiler plants in various combinations with the gas turbine technologies in the CCP units of various types and schemes (from CCP where the GT exhaust gas is supplied to the conventional boilers to the creation of the CCP with the integrated gasification combined cycle (IGCC) and with HRSG after the GT).
QUALITY ASSURANCE

The Quality Management System of Krasny Kotelschchik is certified according to the international standard ISO 9001 and for the compliance with the requirements of the American Society of Mechanical Engineers (ASME). The Company is in possession of all required licenses and credentials for the design, manufacture and use of the boiler, heat exchange and auxiliary equipment.

The available ASME certificates allow designing and manufacturing boilers and pressure vessels (high pressure and low pressure heaters, deaerators) with application of “S”, “U” and “U2” stamps. The availability of the ASME certificates is not only the indicator of the technical development of the Company, but also a competitive edge in the international markets for attracting the ASME orders. Krasny Kotelschchik is working to improve its Quality Management System by applying the advanced methods, thereby ensuring the capacity to produce products according to the customer’s requirements. The engineering and production potential of Krasny Kotelschchik assures high quality of the engineering works, equipment manufacturing, as well as its post-warranty service.
Krasny Kotelschchik is working to develop new and retrofitted boiler equipment for thermal power plants. The main trend is to ensure the maximum increase in the performance and ecological indices of the boiler and of the whole power unit. The activity of the enterprise is associated with research and development, experimental design and perspective design works.

The development takes into account the best of many years’ experience in creation, exploitation and operation of boilers of different capacities and types. Research and development activities aimed at increasing the equipment efficiency and development of new designs are carried out in the scientific and technical innovation centre established especially for this purpose, with involvement of all engineering departments. The state-of-the-art software for mathematical modelling of processes and structural members are applied during work. Application of the advanced design and engineering practices reduces the construction risks substantially, both in the new construction and equipment modernization.

- 3D design (equipment general arrangement, separate components and parts)
- 3D modelling of combustion processes in power boilers operating on different kinds of fuel, and optimisation of the combustion systems
- 3D strength calculations with regard to the mechanical and thermal effect
- 3D analyses of the aerodynamics, hydrodynamics and heat transfer in the heat exchange and Heat Recovery Steam Generators
- Complex calculations of structures in the bound combination (aerodynamics – heat transfer – strength)
- 3D design analysis and optimisation of gas ducts, pulverized coal/air pipelines, pipelines and steam pipelines
Krasny Kotelshchik was founded in 1896 in Taganrog. The boiler equipment production was launched in 1932. 80% of thermal power plants in Russia are provided with equipment supplied by PJSC Krasny Kotelshchik. The manufacturing facilities are located on 108 hectare lot. Currently, Krasny Kotelshchik can produce power equipment for 4GW power plants annually. The Company has a favourable location considering the transport options: Krasny Kotelshchik is located 2 kilometers from the federal highway Moscow-Rostov-Mariupol, in the immediate vicinity of the North-Caucasian Railway (there is a branch railway linked to it), has access to the Sea of Azov through Taganrog Sea Cargo Port.

The production structure of Krasny Kotelshchik incorporates departments typical of a large power engineering company. The production departments are classified according to 4 process technologies:

- **Heating Surface Production**
  Product Line: gastight panels, superheater assemblies (convective, platen, radiation and ceiling superheaters), heating surfaces, water economizers, and Heat Recovery Steam Generator (HRSG) modules.

- **Drum and Shell Production**
  Product Line: high pressure heaters, low pressure heaters, high pressure drums, intermediate pressure drums, low pressure drums, evaporators, deaerators, separators, chemical water treatment filters and condenser plants.

- **Steel Structure Production**
  Product Line: welded and bolted steel structures, regenerative and tubular air preheaters, burners, hangers, tie rods and connecting parts of pipelines.

- **Blank Production**
  Product Line: the provision of the assembly workshops with parts of plates and rolled plates, fabrication of the boiler internal piping, machining and assembly works, machining of parts for the assembly workshops, as well as manufacture of power valves, valves for high pressure heaters and soot blowers, the production of a wide range of forgings and stamped blanks for the assembly workshops.

Krasny Kotelshchik offers the aftersale service package for the erection supervision, commissioning supervision, test supervision of the boiler and boiler auxiliary equipment, modernization, repair and rehabilitation works, supply of spare parts and special materials, as well as the complex retrofitting of the boiler island with improvement of the boiler capacity and efficiency, and emission reduction.

The aftersale services include a technical manual for the works on the erection; commissioning and putting into operation of the power equipment, as well as the guarantee maintenance, participation in the scheduled repairs, repair engineering support, development of the repair technology, the customer’s personnel and his contractor training, consulting services and aftersale services. Krasny Kotelshchik is ready to offer modernization of other supplier’s boilers basing on the customer feedback and available experience in modernization and reconstruction.

**PRODUCTION**

**SERVICE AND MODERNIZATION**
Service of Boilers within the Product Line of Krasny Kotelschchik depending on the Types of Boilers

- Introduction of technological measures for the reduction in the NOx (nitrogen oxide) emissions (application of the multi-stage fuel combustion schemes, new low-NOx burners, recirculation, etc.).

- Application of the dry-ash removal when using bituminous coals for reducing the nitrogen oxide emissions.

- Modernization of the boiler components:
  - furnace water wall reconstruction (replacement of water walls for the gastight/membrane water walls);
  - change in the burner devices and arrangement of the three-stage fuel combustion (“reburning” process) using the natural gas as a reducing fuel;
  - application of the selective noncatalytic NOx reduction system to satisfy the standard NOx concentration limits;
  - reconstruction of the pulverized coal system and high concentration dust feeding system;
  - reconstruction of pc/gas/air lines.

- Reconstruction of gas-fuel oil boilers ТГМП-314 and ТГМП-344 with build-up of gas-turbine plant steam turbine unit (CCP scheme where the GT exhaust gas is supplied to the boiler).

- Replacement for the modernized Boilers (ТП-80, ТП-87 for ТП-87М; ТП-170 for ТП-170М; ТП-230 for ТП-230М; ТГМ-84 for ТГМ-84М), intended for replacement of the boilers which completed their service life without sacrificing, by the results of the diagnostics, the foundations, supporting steel structure and drum.

- Modernization of Boilers (ТП-216М, ТП-100М, ТПП-110М, ПК-33М, П-50, П-50М, П-57-Р, БКЗ 640-140 ПТ М ), depending on the types, for the purpose of:
  - increase in the energy efficiency (EE) (efficiency upgrading);
  - main steam temperature increase;
  - boiler steaming capacity increase;
  - NOx reduction;
  - particulate control;
  - achieving the latest SOx concentration values;
  - refuse to use the lighting-up fuel in the load range 70-100 Dnom;
  - air leakage reduction.

- Modernization of the air preheater (RAPH) seals for further reduction in air leakages.