

OPEN JOINT-STOCK COMPANY
KALUZHSKY DVIGATEL

CASTING AND FORGING



www.kadvi.ru

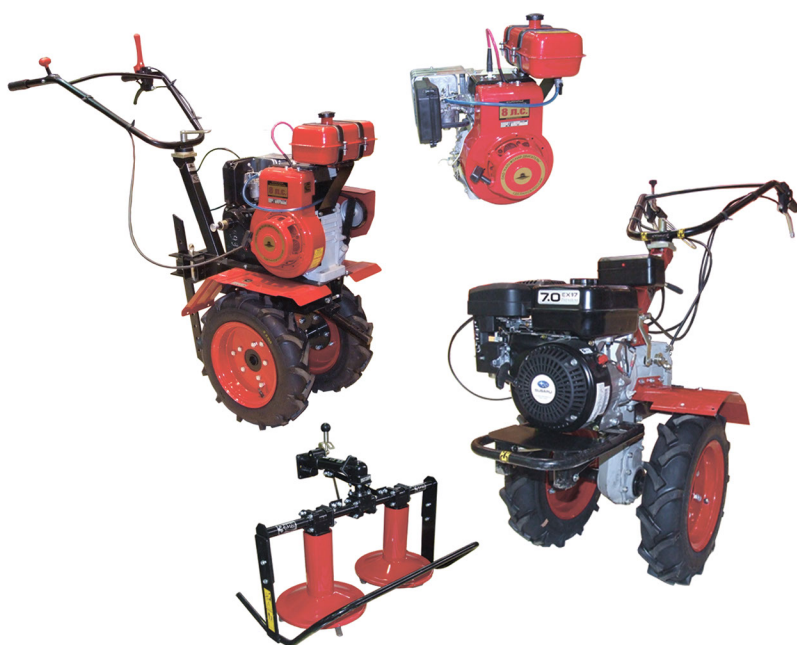
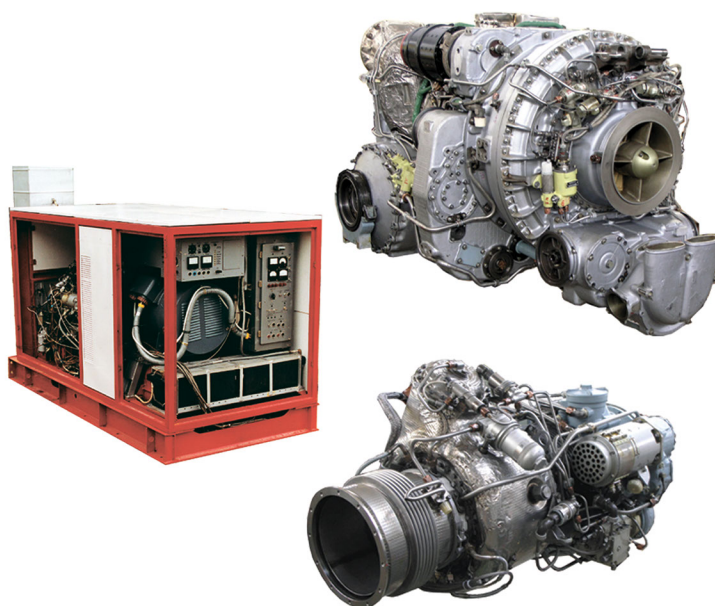
OJSC Kadvi is a winner of the Kaluga Government Awards for quality and social efficiency of 2011. It is the one of the largest engineering companies in the Kaluga region, which employs more than 3,000 people. With modern equipment, an automated management system and qualified personnel, the company provides consumers with quality products, of high reliability and long service lifetimes.

PRODUCTS

GAS TURBINE MACHINERY

The company is the only plant engaged in the mass production of low-power gas turbine engines for use in ground power plants.

Gas turbine power plants, mini-TPP and autonomous gas turbine power equipment (adapted to liquid fuel and natural gas).



MINOR AGRICULTURAL EQUIPMENT

Gardening equipment: OKA tillers, UGRA tillers, gasoline engines, ZARYA rotor mowers, Sadovnik cultivators .

KADVI gardening equipment became one of the "100 best goods of Russia" 7 times and has received the certificate for this competition 8 times.

INDUSTRIAL PRODUCTS

OJSC Kadvi focuses on the production of gears and mechanical treatment, casting services, heat treatment and electroplating, and the production of tools and accessories. High quality of KADVI products is guaranteed with the use of new equipment and advanced technologies.



QUALITY ASSURANCE

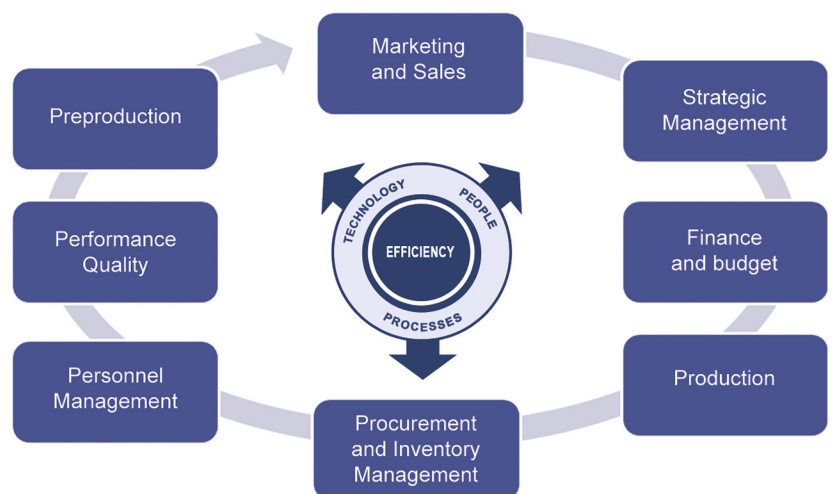
The quality assurance for these products is based on a systemic approach and compliance with ISO 9001-2008. All quality assurance activities are scheduled with the annual development of plans for the QMS, environmental management systems, occupational health and safety, and the financial management system.



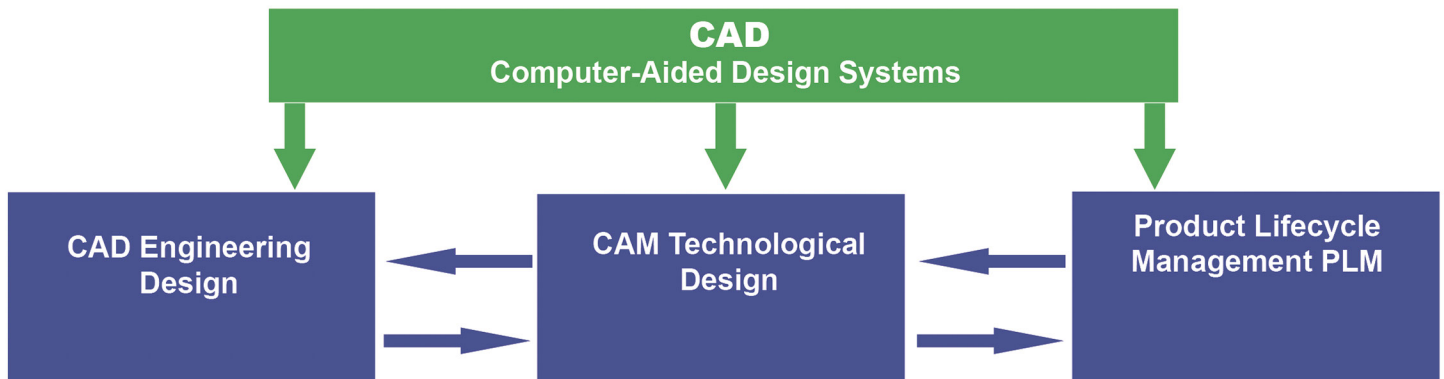
The company is constantly working to prevent defects. The result of this effective system is a high level of quality and reliability, confirmed by diplomas and certificates.

PROCESS MANAGEMENT

KADVI enterprise management, including production, is performed using the automated ERP II Microsoft Dynamics AX system, in compliance with MRP II. This ensures transparency, increases the efficiency of communication with business partners, and provides a competitive advantage needed in the current rapidly changing environment. The KADVI management system is integrated with other automated systems: design and technological processes management, human resource management, etc.



All units operate online in a single information space. The automated system provides transparency of resources movement, the real time management of financial and inventory flows. OJSC KALUZHSKY DVIGATEL independently carries out all work to ensure the product lifecycle: creation of technical ideas, design, engineering, technological support, the production of parts and components, and the assembly and testing of products.



A modern engineering center is established and functioning using advanced computer-aided design. A unique manufacturing system has been created based on up-to-date, powerful machines and processing centers. KADVI is constantly improving production and implementing innovative technologies. All of this together increases the efficiency and quality of the production processes making it attractive to young professionals.



WORK WITH CUSTOMERS



Work with customers is carried out by experts in marketing and sales. Every wholesale buyer is assigned a personal manager in charge of their order, which ensures timeliness and accuracy in the execution of consumers' orders. The process of working with consumers is automated. An operational order processing system, and modern warehouse facility ensure significant time saving and prompt shipment of products to customers. The important consumer benefit of KADVI technology is the availability of warranty and service support and the opportunity to seek advice from qualified professionals. Products maintenance and repair is performed by KADVI service center.

SOCIAL EFFICIENCY

KADVI is a reliable employer of over 3,000 people. In 2011, the company was honoured by the Government of the Kaluga Region as an organization of high social efficiency for the development of labour potential and social partnership. About half of the total number of employees are young specialists. The company values its employees' work, believing that the staff is the main key to success. Salaries are paid in time and indexed annually. A great deal of attention is paid to training and skills development, motivation and strengthening the corporate spirit of the staff. The enterprise applies various types of benefits and bonuses, the employees are provided with quality health care and good nutrition subsidized at the company's expense.





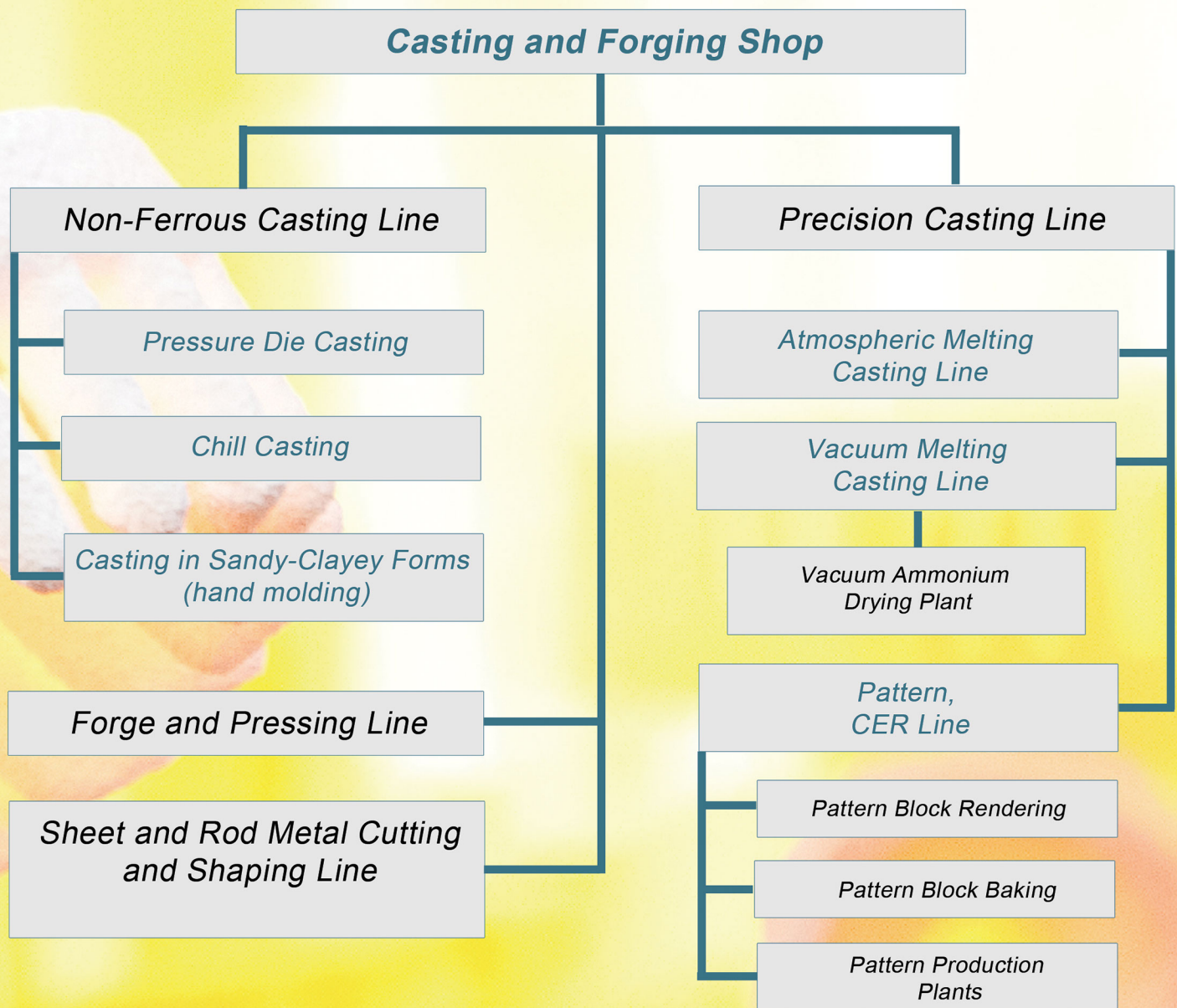
OJSC KADVI CASTING AND FORGING

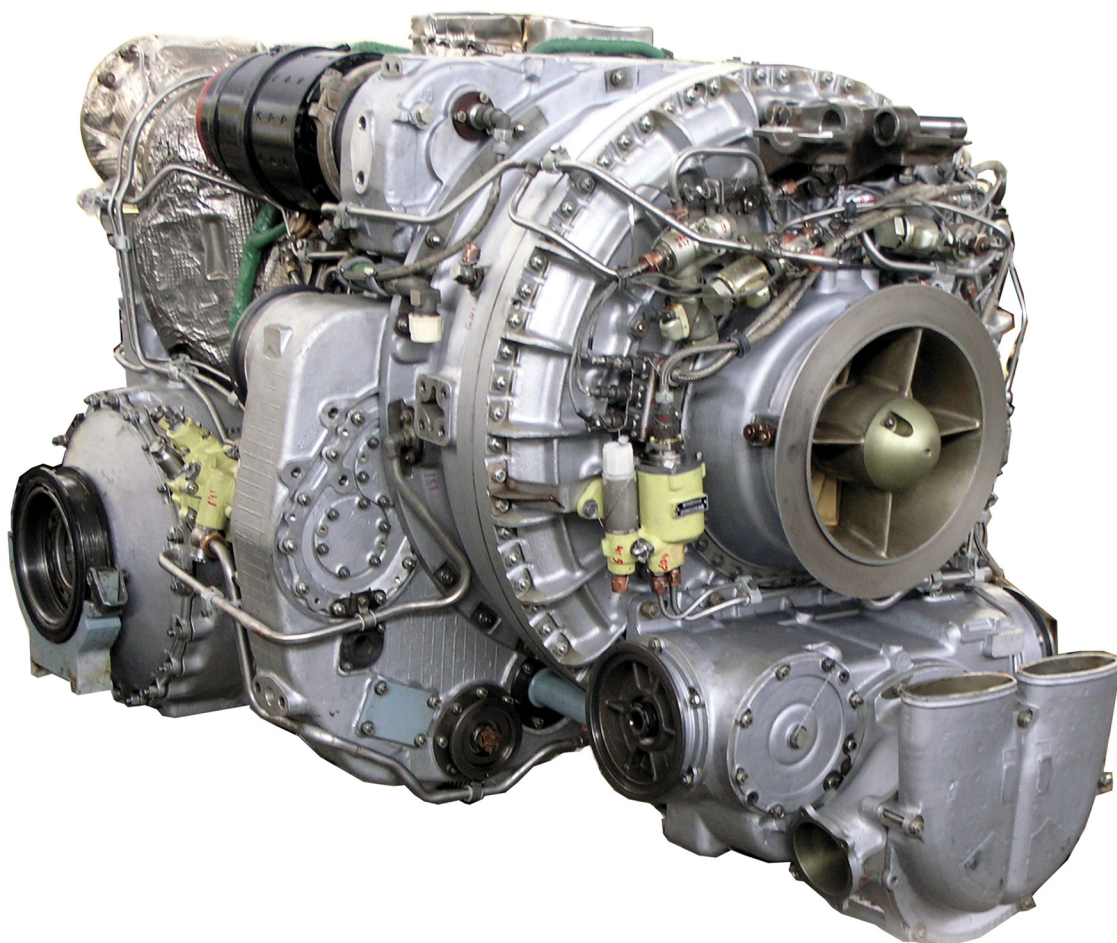
Casting and forging is a holistic process that encompasses all the necessary aspects of casting from quality control of incoming metal materials to finished parts output, including customized castings with complex shaped surfaces.

ENGINEERING CAPABILITIES OF CASTING AND FORGING

- Investment casting of atmospheric carbon and alloy steel smelting;
- Investment casting of vacuum heat-resistant alloy smelting;
- Shell mold casting of carbon steels and cast irons;
- Green-sand casting of gray and high-grade cast iron;
- Dry-sand casting of carbon steel and high-grade cast iron;
- Pressure die casting of aluminum and zinc alloys in ATD devices with a force of 160, 400, 1000 tf;
- Chill casting of aluminum and bronze alloys;
- Low pressure die casting of aluminum alloys;
- Green-sand casting of aluminum alloys;
- Hot and flash-free stamping on crank presses with a force of 1000, 1600, 2500 tf and screw press of 3200 tf;
- Hot stamping on upsetting machines;
- Cold stamping on crank presses with a force of 100, 160, 250 tf;
- Open forging steel on air hammers with a force of 1.5 and 3 t;
- Heat treatment of carbon steel, cast irons, aluminum alloys;
- Cutting metal on the abrasive, circular, belt machines;
- Metal chopping on alligator and guillotine shears;
- Metal plasma cutting;
- Sand blasting and shot blasting in chambers, drums and shot blaster;
- Manufacturing of wood patterns for casting.

CASTING AND FORGING PRODUCTION STRUCTURE





A casting and forging complex has been created by OJSC KADVI for manufacturing of gas turbine plants, thus it provides and guarantees high demands as regards materials and quality control, using unparalleled metallurgical technology.

KADVI Casting Production features the capability for rapid development of a wide range of castings for various purposes with minimal production cost. The vast experience in castings' manufacturing employing various kinds of casting, modern technology and equipment, as well as constant upgrading of production facilities ensure high quality products.



MATERIALS AND TECHNOLOGIES USED IN THE CASTING INDUSTRY

Today, the casting industry has mastered the treatment of 16 types of steel and alloys - from simple carbon to high-alloy steels, and 11 types of aluminum and copper alloys.

The following technologies are applied:

- manufacture of castings without support filler;
- surface modification;
- pattern mass rendering in steam pressure vessels;
- electrocorundum regeneration;
- investment casting.



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ОПИСАНИЕ

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АРХИВ ФОРМ (Sh+F2)

АВАРИИ (Sh+F3)

КОНТРОЛЬ КАЧЕСТВА ПРЕССОВАНИЯ (Sh+F4)

ПЕРЕХОД В ICS

ТЕМПЕРАТУРА РАБОЧЕЙ ЖИДКОСТИ

35 °C

ЦИКЛ

12

СМАЗЧИК (F1)

ДОЗАТОР (F2)

СЪЕМНИК (F3)

ПРОГРАММЫ (F4)

СМАЗКА МАШИНЫ (F5)

ВЫТАЛКИВАТЕЛЬ (F6)

СТЕРЖНИ (F7)

ЗАПИРАНИЕ (F8)

ПРЕССОВАНИЕ (F9)

ВРЕМЕНА (F10)

ПРОИЗВОДСТВО (F11)

ДИАГНОСТИКА (F12)

ТЕХОБСЛУЖИВАНИЕ

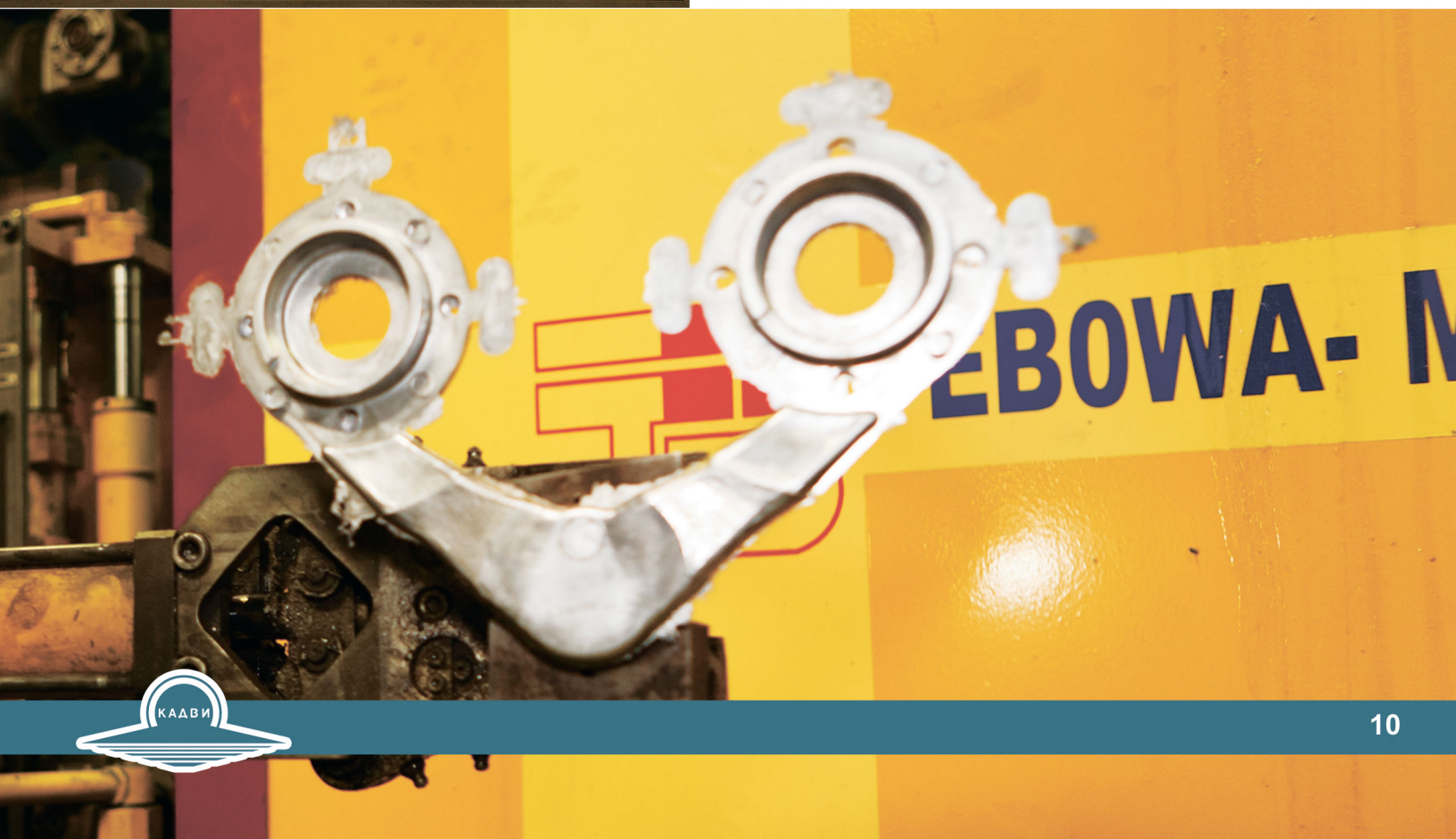
ПРО НАС

tebowa

ВЫКЛЮЧЕНИЕ КОМПЬЮТЕРА (Sh+F10)

Выход в систему

TST-160LK



Casting production planning utilizes casting process 3D-modeling modern computer systems. The software allows verification of the quality of the future details prior to receiving the first prototype. Enables detection of thermal units of parts and prevention of a threat of sediment casting defects during solidification. Based on the results of the casting analysis, the timely technological actions are held to prevent the formation of defective zones and ensure the quality of cast components.



The Precision Casting Line provides a high level of surface finish and products precision. Castings weighing from a few grams to 21 kg, up to 500 mm, with wall thickness up to 0.5 mm, with a deviation tolerance $+0.05 \dots -0.1$ mm surface roughness Ra 2.5 are produced there.



Non-Ferrous Casting Lines produce castings weighing up to 35 kg, up to 530 mm, with wall and edges thicknesses up to 1.5 mm and a tolerance of ± 0.15 mm.



PRECISION CASTING

Precision Casting is a method of obtaining castings with minimum allowance for machining and high surface finish. Investment casting meets these requirements best.

PATTERN, CER LINE: pattern making, rendering and baking of pattern blocks.

Process equipment:

► Semi-automatic boiler vessel 08/06 LBBC 1220

Excess steam pressure in the process chamber - 8...10 Pa
Operating cycle - 2...15 min
Dry steam temperature in rendering chamber – up to 250 °C

► Baking furnaces KS-2000, PVP-3000/12.5 and PVP-1000/12.5

Rated temperature - 1000 /1200 °C
Rated power - 120/150 kW

► Vacuum Ammonium Drying Plant UVS-3

Number of blocks loaded -108 pcs
Working medium – ammonia gas
Chamber inner diameter - 1800 mm
Chamber working space length - 2220 mm

► Hydraulic Press PG 5

Force at the process stem - 2000 kg
Pressing capacity - 20 per hour
Piston stroke - 350 mm
Screw pitch - 350 mm

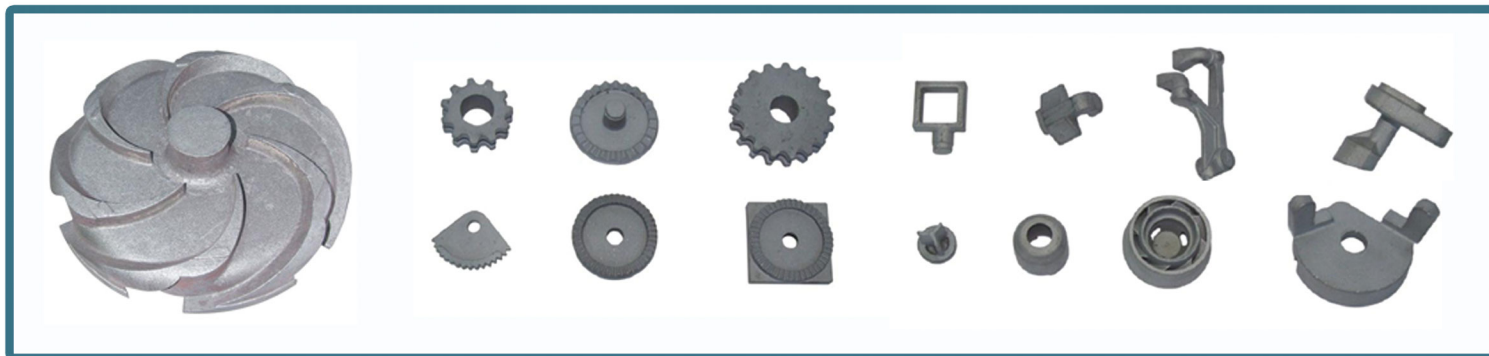
► Wax Pattern Production Press APVM-1M

Force at the process stem - 700 kg
Pressing capacity - 250 per hour
Piston stroke - 250 mm
Screw pitch - 250 mm



ATMOSPHERIC MELTING CASTING LINE

Range of castings produced



Process equipment – induction-melting crucible furnaces IST-0.25

Melter capacity - 250 kg

Performance – 1.6 ton per shift



VACUUM MELTING CASTING LINE

Range of castings produced



Process equipment :

► Vacuum melting casting plant ISV-0.16

Melter capacity – up to 160 kg according to TDS
Vacuum – $133 \times 10^{-3} \text{ Pa}$

► Automated vacuum melting casting plant with mould pre-heating UPPF ZM

Melter capacity – up to 30 kg
Vacuum – $665 \times 10^{-3} \text{ Pa}$ according to TDS

NON-FERROUS CASTING

PRESSURE DIE CASTING LINE

Ferrous casting is intended for rational pieces of non-ferrous metals and alloys (zinc, aluminum, copper).

Range of castings produced



Process equipment :

- ▶ **TEBOWA** - automated system for pressure die casting with horizontal cold die chamber TST-160L with automatic dosing by casting-dosing machine, greaser and controller SIEMENS S7-300

Pressing force - 240 kN.
Min press mold height - 220 mm.
Max press mold height - 500 mm.
Max aluminum alloy cast weight – 2.4 kg.

- ▶ **High pressure die casting machine A711112-P**

Locking force - 10000 kN
Pressing force - 790...2150 kN
Operation cycle time - 15 s.
Cast metal weight - 18 kg.

- ▶ **Automated system for high pressure die casting A711A09**

Locking force - 4000 kN
Pressing force - 450 kN
Operation cycle time - 15 s.
Cast metal weight – 9.5 kg.

- ▶ **Automated system for high pressure die casting A711A07**

Locking force -1600 kN
Pressing force - 200 kN
Operation cycle time – 14.7 s.
Cast metal weight – 2.4 kg.

- ▶ **Low controlled pressure die casting machine ALUG-3**

Plate size - 1250x1000 mm.
Operation cycle time - 40 s.
Cast metal weight - 15 kg.

CHILL CASTING LINE

Process equipment

► Chill casting unit CGU

Plate size - 550x550 mm.
Operation cycle time - 60 s.
Cast metal weight - 8 kg.

► Chill casting unit CGU

Plate size - 450x450 mm.
Operation cycle time - 60 s.
Cast metal weight - 0.5 kg.

Range of castings produced




CASTING IN SANDY-CLAYEY FORMS (HAND MOLDING)

Range of castings produced



FORGE AND PRESSING LINE



OJSC KADVI Forge and Pressing Line ensures the release of a wide range of complex items with minimal allowances for machining using the method of forging, stamping and pressing. A modern production facility makes it possible to produce quality parts complying with national and international standards with partial and full heat piece treatment and weighing 0.1 to 8.0 kg.

PROCESS EQUIPMENT

► Hot-Forging Press with force of 1000 t/f

Piece weight – up to 1.5 kg

Piece dimensions – diameter up to 100 mm

Accuracy - + 0.7...- 0.4 mm

Material - carbon, alloy, heat-resistant steels, aluminum alloys

Range of pieces:



► Hot-Forging Press with force of 1600 t/f

Piece weight – up to 3 kg

Piece dimensions – diameter up to 110 mm

Accuracy – +1.5...-0.9 mm

Material – carbon, alloy, steels, aluminum alloys

Range of pieces:



► Hot-Forging Press with force of 2500 t/f

Piece weight – up to 13.0 kg

Piece dimensions – diameter up to 200 mm

Accuracy - + 1.5...- 0.9 mm

Material - carbon, alloy, heat-resistant steels, aluminum alloys

Range of pieces:





- Forging hammer with a drop part weight of 3 tons.

Forging weight – up to 80 kg

Dimensions – diameter up to 500 mm

Accuracy - +5.0... -3.0 mm

Material - carbon, alloy, heat-resistant steels, aluminum and titanium alloys

Open forgings



- Horizontal forging machine with force of 630 t/f

Piece weight - up to 80 kg

Piece dimensions – diameter up to 110 mm

Accuracy - +1.3...-0.5 mm

Material - carbon, alloy steels, aluminum alloys

Range of pieces:



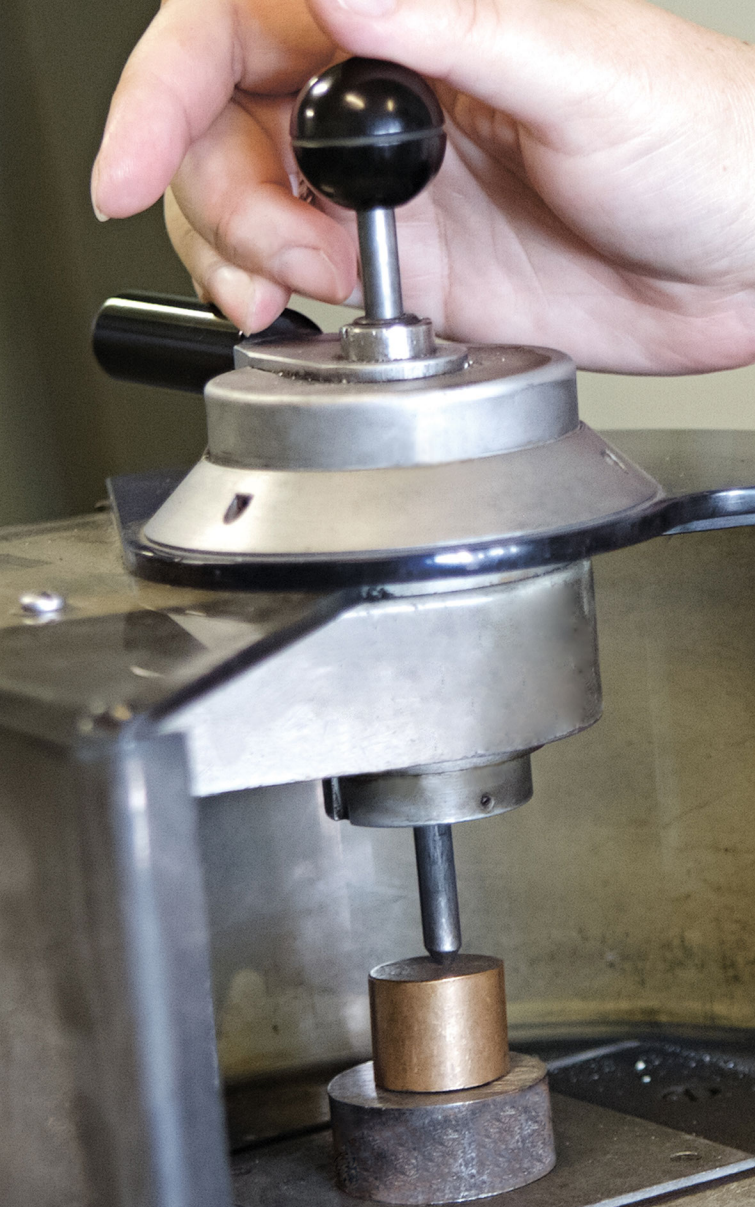
QUALITY CONTROL

Monitoring of fulfillment of the quality management system requirements is carried out at all production stages, from inspection of incoming materials to the product acceptance control. In accordance with the regulations, checks and validation of process equipment, tooling, measurement devices, analysis of process discipline at the workplace, and preventive monitoring are carried out. Owing to this system, a minimum level of defects, in accordance with European standards, is ensured.

Quality control is carried out by:

- Central Laboratory being part of KADVI Quality Service includes the following laboratories: chemical, chemical engineering, metallurgical, mechanical testing, spectral, X-ray, ultrasonic testing, magnetic testing and dye penetrant inspection.
- Shop Technical Control Bureau.





CASTING QUALITY CONTROL METHODS USED

Spectral Analysis

Applied at the incoming materials inspection stage and during the analysis of the finished product.

Designed to determine the qualitative and quantitative composition of the metal.

Vacuum quantometer is used for analysis, which determines 24 constituent elements at a time, including carbon, sulphur and phosphor.

Conducted in the central laboratory.





Visual and measuring inspection

Used to analyze the quality of the finished product before special control.

Designed for the prevention and detection of defects in the product and is based on obtaining information about the inspected object by means of measurement and optical devices.

Applies microscopes, lenses, radial patterns, test leads, set squares, calipers.

Conducted in shop technical inspection offices.

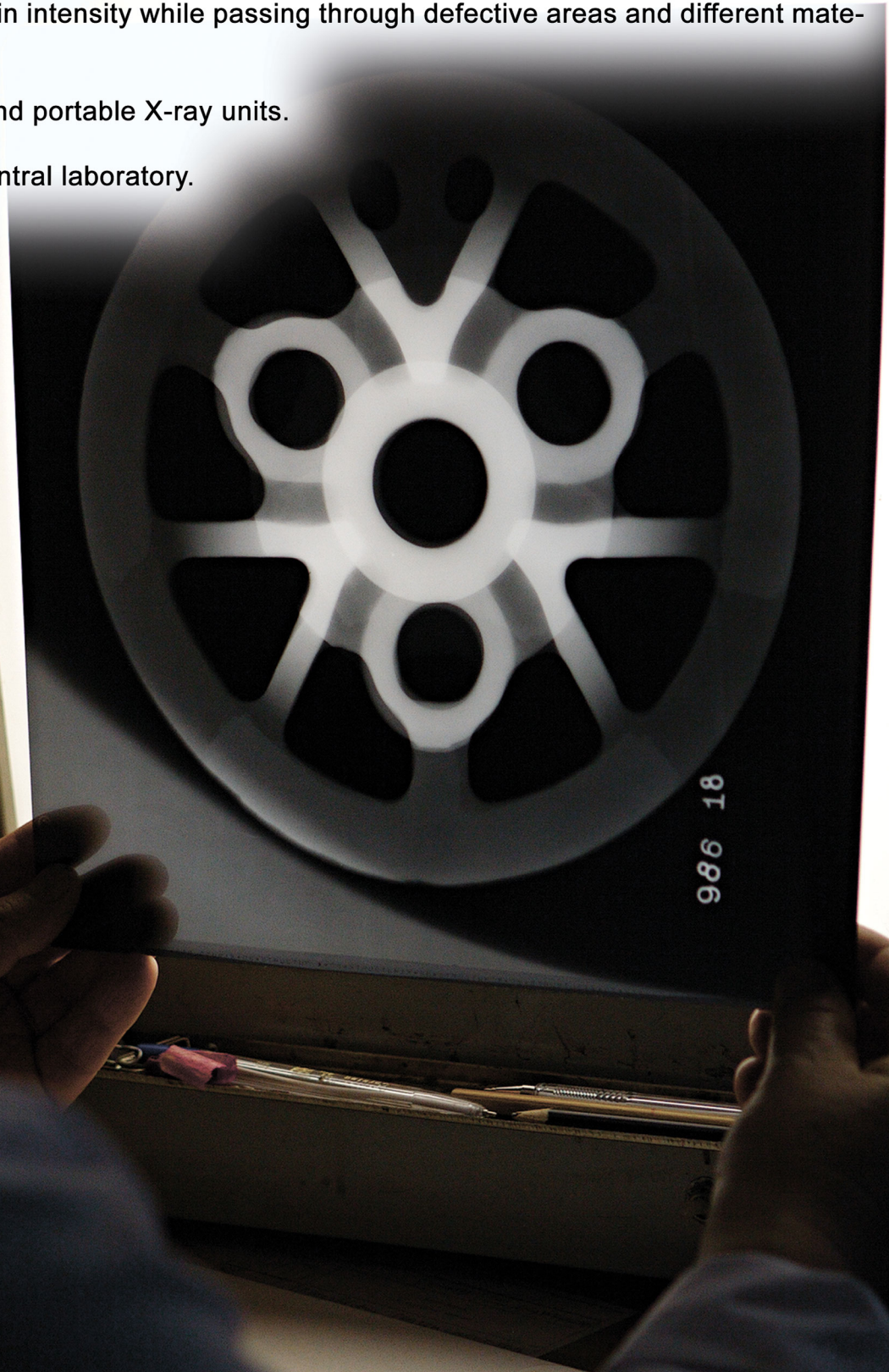
Radiation flaw detection

Used to analyze the quality of the finished product. Refers to non-destructive testing.

Designed to detect internal defects in castings of any configuration. Based on the ability of X-rays to change in intensity while passing through defective areas and different materials.

Applies stationary and portable X-ray units.

Conducted in the central laboratory.





LUM-control or capillary method of nondestructive control

Used to analyze the quality of the finished product. Refers to non-destructive testing.

Designed to detect hidden defects that are invisible to the unaided eye and connected to the surface of the object of control. Based on capillary penetration of indication fluid into a defect that is exposed to a UV light. The indicator tracks as lines indicate cracks, scratches or pores.

Applies ultraviolet irradiator KD-ZZL and ultraviolet plant KD-20L.

Conducted in the central laboratory.



CAD control

Used to analyze the quality of the finished product.

Designed to determine the quality and geometric parameters of products with complex shaped surfaces. Based on a comparative analysis of the standard CAD model and the finished product.

Applies coordination and measuring arm INFINITE 5012.

Conducted in shop technical inspection offices.

AUXILIARY AND RELATED PRODUCTION

KALUZHSKY DVIGATEL handles the whole cycle of the production of castings, from inspection of incoming materials from suppliers to the shipment of finished parts to customers.

TOOL PRODUCTION

The stamps, molds, other equipment used in casting and forging are manufactured in the tool shop of OJSC KADVI. The basis of the process equipment are Hermle five-axis machining centers, Apsa grinding machines, Sodik AG600L electrical discharge wire cutting machine, AGIECUT electroerosive machines.



METAL PREPARATION FOR PROCESSING

Applies: metal cutting at abrasive, circular, belt machines, metal chopping at alligator and guillotine shears, metal plasma cutting.

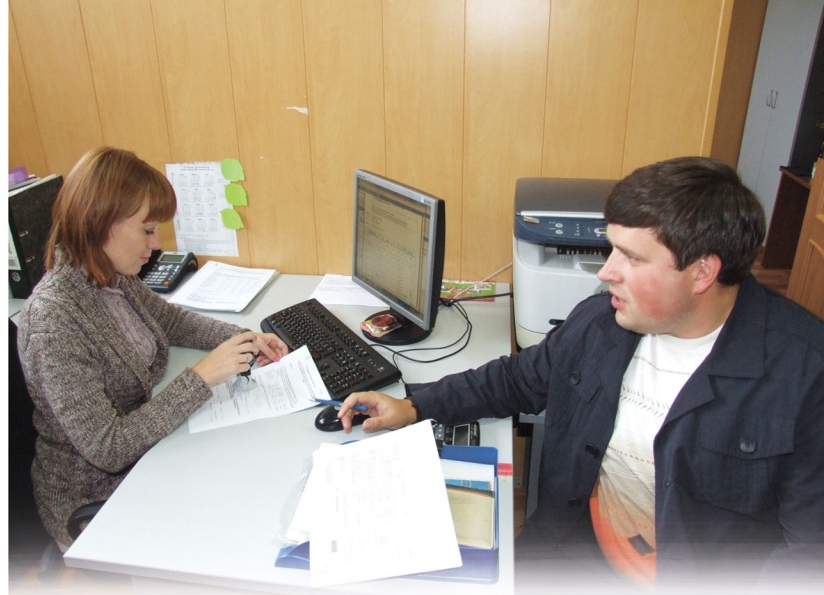


PRODUCTS CLEANING

Applies sand and shot blasting in chambers, drums and shot blaster.

SHIPPING OF FINISHED PARTS TO CUSTOMERS

Manufacturing process of casting and forging parts concludes with acceptance by the shop technical inspection office and delivery to the finished products warehouse to await shipment to the customer.



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