



**BUSINESS UNIT «MACHINERY CONSTRUCTION»**

## HISTORY

ZAVKOM was founded in 1933 as a chemical machinery plant.  
The following milestones in the company's history are noteworthy:

**1933**

The first equipment for the chemical industry was manufactured: units for separating coke cooling and distillers.

**1946**

Large apparatus made of corrosion-resistant and heat-resistant steels were produced.

**1948**

Distilling plants and heat-exchange equipment were first manufactured for the shipbuilding industry, including equipment for the nuclear-powered icebreaker Lenin.

**1966**

By Decree of the Praesidium of the Supreme Soviet of the USSR, for ensuring high growth rates in the production of complex chemical apparatus, the enterprise was awarded the Red Flag Order of Labour.

**1970**

Technology was developed for the manufacture of equipment from bi- and tri-metal for especially aggressive products and research in nuclear physics.

**1992**

The first turnkey projects in biotechnologies were implemented.

**2000**

The production of installations for gas purification and treatment was mastered. The company developed active collaboration with OJSC Gazprom.

**2001**

The production of equipment for nuclear power stations was mastered. Equipment was designed, manufactured and delivered for the Kola Nuclear Power Station.

**2007**

The company engaged in scientific research in the design and production of innovative nano-materials, investing its own funds in the venture.

**2014**

The company was restructured and rebranded.

Throughout its entire history, ZAVKOM has continually expanded its engineering, science, technical and production potential, uncovering new lines of business and developing the company.

## INTRODUCTION

ZAVKOM is a leading Russian industrial holding company. Since 1933 the company has been known in the world market as an EPC contractor and manufacturer of equipment for oil, gas and petrochemical industries.

More than 1500 professional employees (400 engineers), the company's own manufacturing plant and R&D center – all these makes it possible to execute complex high-tech industrial projects.

The company provides clients with the innovative solutions and helps them to establish profitable business. We use state-of-the-art technologies and quality management systems to create competitive products and services.

ZAVKOM with its extensive experience in engineering, procurement and construction guarantees its customers high services and professional management at all stages of project implementation.

The company's business grows rapidly and constantly develops production level extending market share and geography of sales. ZAVKOM cooperates with 92 companies from 25 countries. The company's head office is in Tambov city (Russia), representative offices are located in Moscow, Prague (Czech Republic), Minsk (Belarus), Dubai (UAE) and Hanoi (Vietnam).

ZAVKOM collaborates with leading Russian and international research centres and engineering companies including Toyo Engineering Corporation, Maire Tecnimont and Linde. The company's R&D centre successfully carries out research and development work in nanomaterial sphere.

Nowadays the company's business consists of seven business units engaged in different sectors of industry.

# OWNER'S STATEMENT



## DEAR CLIENTS, COLLEAGUES AND PARTNERS!

In recent years there has been much discussion of the need to develop high-tech production and in-house expertise, to create and promote new engineering solutions for international markets.

I am convinced that Russian future, its uniqueness and leading positions will be secured through developing our own, powerful production base. I believe that our country has significant potential in the development and creation of new technologies.

Since 1933 we have been engaged in the design and production of engineering equipment, and always put quality first. We tap into the colossal engineering experience of both in-house development, and accumulated by Soviet industry as a whole.

At the same time we do not rest on our laurels. Thanks to an active dialogue with clients and partners, the company is developing new lines of business, uncovering new sales markets, international markets included, is engaged in scientific research

and experimental design work and is elaborating new technologies and engineering solutions. We are helped in this by a clear vision of market trends, an understanding of the needs of our clients, production and design discipline, and collaboration with leading Russian and international research institutes and engineering companies.

**ZAVKOM main priorities today are to satisfy the interests of our customers at the highest possible level, ensure industrial safety and continually move forward.**

Vladimir Artemov ✂

# ZAVKOM STRUCTURE



A worker in a red ZAVKOM uniform and white hard hat is working on a large industrial machine. The worker is wearing safety glasses and is focused on the task. The machine has a large circular opening and various pipes and components. The background is dark and industrial.

BUSINESS UNIT  
«MACHINERY CONSTRUCTION»

**BUSINESS UNIT MACHINERY CONSTRUCTION, BASED ON OUR OWN PRODUCTION FACILITIES, MANUFACTURES EQUIPMENT FOR THE TURNKEY IMPLEMENTATION OF ZAVKOM PROJECTS AND NON-STANDARD EQUIPMENT AS PER THE CUSTOMER'S REQUIREMENTS.**

Equipment of various types is manufactured with an internal diameter up to 5000 mm in assembled form, working pressure up to 21 MPa, capacity up to 5000 m<sup>3</sup>, wall thickness up to 120 mm, length up to 40 m and total weight up to 130 tonnes in assembled condition:

- reactors
- columns
- heat exchangers
- filtration equipment
- tanks up to 5000 m<sup>3</sup> capacity
- capacity apparatus
- silos (bunkers)
- vacuum evaporators
- equipment for the production of hydrogen and oxygen using the PSA method
- equipment for air distribution installations
- process piping
- polymerizers

**MATERIALS:**

- stainless and carbon steel
- bi-metal and tri-metal
- copper
- aluminium and its alloys
- titan
- hastelloy
- monel

All equipment is manufactured in compliance with international safety and quality standards, pursuant to technical standards and satisfying the individual requirements of our customers (ASME, EN 13445, Directive 97/23/EL, TEMA, Linde and other). ▀

## REACTOR EQUIPMENT



ZAVKOM produces polymerizers for polymer solution processes. Polymerizers are vertical cylinder apparatus equipped with branching pipes for raw charging, catalyst agent feed and subsequent reaction mass extraction. Polymerizers may be equipped with the cooling jacket, cylindric-shaped build-in cooling internal barrel, agitator, scraper-type agitator, internal heat exchangers.

Polymerizers are produced according to individual design projects. Production material - corrosion-resisting steel. ▽

### SPECIFICATIONS:

- Internal diameter 5000 mm
- Weight up to 130 tonnes after installation

## CAPACITIVE EQUIPMENT



ZAVKOM manufactures capacitive equipment designed for the acceptance, storage and release of liquid and gaseous (including harmful, explosive and/or fire-hazardous) substances.

Capacitive equipment is manufactured with a working pressure up to 21 MPa, capacity up to 5000 m<sup>3</sup>, internal diameter up to 5000 mm, wall thickness up to 120 mm, length up to 40 m and total weight up to 130 tonnes when assembled:

- without internal devices
- with static internal devices
- with agitators

- with internal or external heating or cooling devices
- with thermal insulation
- air collectors
- bunkers (silos) for storing granular and powder materials and chemical products

The apparatus is designed on the basis of individual projects and can be manufactured from stainless steel, carbon steel and aluminium. ▽

## HEAT EXCHANGERS



ZAVKOM manufactures heat-exchangers designed for heating, cooling, condensation and evaporation of liquid, gas, steam and their mixtures.

Heat exchanging equipment of various types is manufactured with an internal diameter up to 5000 mm in assembled form, with working pressure up to 21 MPa and total weight up to 130 tonnes when assembled:

- with fixed tube sheets
- with temperature expansion bellow installed on the shell

- with floating head
- with U-shaped tubes
- tube in tube

The apparatus is designed on the basis of individual projects and can be manufactured from carbon, corrosion-resistant steels, aluminium and copper. ▽

## TANKS



Business Unit Machinery Construction manufactures vertical, cylindrical tanks from stainless and carbon steels with a capacity from 100 m<sup>3</sup> to 5000 m<sup>3</sup>, designed for storing aggressive and explosive substances used in the chemical and petro-chemical industries. We also offer services on their integrated design, manufacture, assembly of ladders, service platforms and process piping.

The tanks can be manufactured with a working pressure of up to 0.005 MPa and a temperature from -50°C in a vacuum up to 1000 Pa, of varying design and configuration:

- with conical, self-supporting roofs
- with conical, wire-frame roofs
- with domed roofs
- with internal floating roofs
- with internal devices
- with heat insulation
- with heating and cooling coils

The buildup method of construction technology allows to manage the construction without the use of crane-age and saves montage space. ▀



## COLUMNS



ZAVKOM manufactures column equipment designed for heat and mass-exchange processes.

### EQUIPMENT TYPES:

- rectification columns
- absorption columns
- desorption columns

### TECHNICAL SPECIFICATIONS:

- internal diameter up to 9,7 metres in assembled form
- length up to 40 metres in assembled form
- mass up to 130 tonnes in assembled form

Columns are constructed with the use of different mass-transfer elements including valving, capped, perforated, tunneled and cap-perforated trays; regular and dumped packing. Columns are produced in fully welded and packed shell variants.

The column equipment is designed on the basis of individual projects and can be manufactured from corrosion resistant and carbon steels, aluminium, bi-metals and alloys.

### MASS-EXCHANGE TRAYS AND PACKINGS FOR COLUMN EQUIPMENT

We manufacture effective regular packing, designed for mass-exchange processes, heat exchange, rectification, absorption, desorption and separation. ▀



## PRODUCTION OF HEADS AND BOTTOMS

### MATERIALS:

- carbon steel
- low-alloyed steel
- high-alloyed and corrosion-resistant steel
- copper
- aluminium



In 2004, ZAVKOM using the equipment of «Schleifstein» company (press for accelerating punching, Edge-bending machine) mastered the serial production of heads and bottoms for capacitive equipment by cold stamping and rolling method with internal diameter from 800 mm to 7,200 mm and wall thickness from 3 mm to 30 mm.

In accordance with the customer's requirements, the bottom plate can be additionally treated. The flanges and inner surface can be processed using

etching, grinding, blast cleaning and heat treatment. Control is also provided over weld seams.

All products are certified and can be manufactured in accordance with standards of the Russian Federation (GOST), Germany (DIN) and the USA (ASME). ❖

## EVAPORATORS

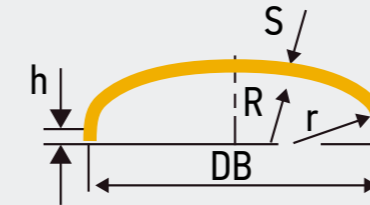
### ZAVKOM MANUFACTURES VARIOUS TYPES OF EVAPORATORS MADE OF SPECIAL ALLOYS AND STEELS:

- Vacuum evaporators
- Atmospheric evaporators
- High pressure evaporators

In the chemical industry evaporation is used for concentration of aqueous solutions of alkali and salts as well as high boiling liquids. Evaporation is widely applied in food, paper, pharmaceutical industry and

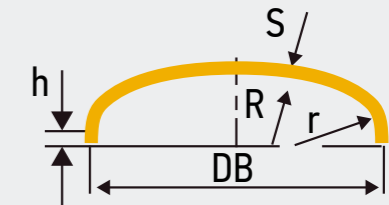
non-ferrous metallurgy. Also nowadays vacuum evaporators are used extensively for construction of industrial water treatment systems. ❖

### PSEUDOELLIPTIC BOTTOM



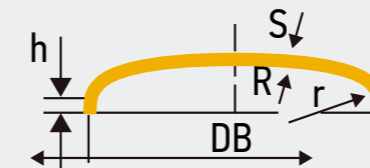
$$\begin{aligned} R &= 0,8 Db \\ r &= 0,154 Db \\ h &= 3S \\ Db &= 800-4500 \\ r &= 100-700 \\ S &= 4-24(4-32) \end{aligned}$$

### PLATE TOROSPHERICAL BOTTOM



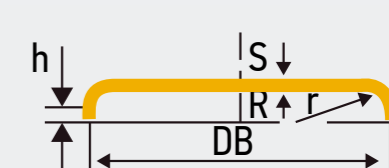
$$\begin{aligned} R &= Db \\ r &= 0,1 Db \\ h &= 3,5S \\ Db &= 800-5200 \\ r &= 100-520 \\ S &= 4-24(4-32) \end{aligned}$$

### PLANO-CONVEX BOTTOM



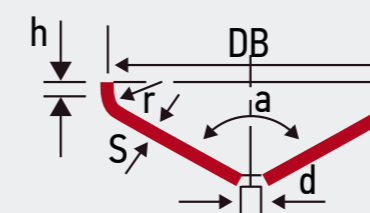
$$\begin{aligned} R &= 1,5 Db \\ r &= 50 \\ h &= 20-50 \\ Db &= 800-5000 \\ r &= 100-700 \\ S &= 3-24(4-32) \end{aligned}$$

### PLATE FLAT BOTTOM



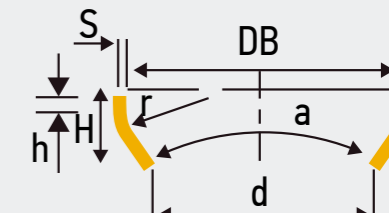
$$\begin{aligned} r &= 50 \\ h &= 20-50 \\ Db &= 800-7200 \\ S &= 4-20(4-32) \end{aligned}$$

### CONE BOTTOM



$$\begin{aligned} a &= 120^\circ; 150^\circ \\ r &= 50 \\ h &= 20-50 \\ Db &= 800-6500 \\ S &= 4-24(4-32) \end{aligned}$$

### CONE BOTTOM



$$\begin{aligned} a &= 70^\circ; 90^\circ \\ r &= 0,1 Db \\ h &= 20-50 \\ Db &= 1600-4500 \\ r &= 160-650 \\ S &= 4-24 \\ H_{max} &= 1200 \end{aligned}$$

## EQUIPMENT FOR THE METALLURGY INDUSTRY



### ZAVKOM PRODUCES THE FOLLOWING EQUIPMENT FOR THE METALLURGY INDUSTRY:

- Metal pouring equipment:
  - steel teeming ladles, including with a sliding shutter gate
  - steel teeming ladles (ladle-furnace)
  - ladles for vacuum casting of steel
  - ladles for pouring pig iron
  - ladles for transporting and pouring molten aluminium
  - ladles for copper, matte and slag
  - bottom plates for ladles (flat, torospherical, convex-plane, conical and others)
  - refining kettles
- Equipment for oxygen stations (air, oxygen and nitrogen receivers with a volume up to 125 m<sup>3</sup> with maximum operating pressure of 3.5 MPa)
- Pressurised tank equipment for various media in bulk (heating jackets, thermal insulation, mixing devices and other types of internal devices)
- Shell-and-tube heat exchangers of different modifications
- Various assembled equipment with a diameter up to 5000 mm, wall thickness up to 120 mm, pressure up to 21 MPa and weight up to 130 tonnes. ▽

## EQUIPMENT FOR NUCLEAR POWER PLANTS



ZAVKOM designs, manufactures and supplies various heat-exchange, water treatment, capacity and other non-standard equipment from stainless and carbon steel, intended for use at atomic energy facilities:

- apparatus with mechanical and hydraulic mixing devices
- capacity and water treatment equipment
- heat-exchangers
- equipment for reclamation of liquid radioactive waste
- filtration systems on the suction line of pumps for emergency shutdown
- non-standard equipment


ZAVKOM is licensed to design and manufacture equipment for atomic power stations. ▽

## PRODUCT QUALITY ASSURANCE



In order to create equipment that is competitive on the international market, we use advanced manufacturing technologies and implement quality management in accordance with the requirements of ISO 9001:2000.

ZAVKOM holds licences from authorities for design, production, installation, commissioning and repair of equipment and certificates of conformity for all equipment produced.

We design and manufacture pressure vessels and apparatus in accordance with the requirements of the American Society of Mechanical Engineers (ASME) and Directive of the Council of Europe 97/23/EC. 

## OUR CLIENTS



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