

Science and Research

Samara Polytech is a key participant in the formation and implementation of scientific and technical policy and strategy for the social and economic development of the Samara region, as well as strategies for the technological development of individual sectors of the regional industry, including the framework of the priority areas of the Scientific and Educational Center "Engineering of the Future".

As a system coordinator of the strategy for ensuring environmental safety and waste management in the region, in 2023, as part of the implementation of major investment projects of the event "Construction of waste management facilities" of the national project "Ecology", Samara Polytech developed design and estimate documentation and a financial and economic model for the construction of four multifunctional waste management complexes in the Samara region, on the basis of which concession agreements were concluded for the construction of facilities in 2024-2026, the total cost of which exceeds 4.5 billion rubles. An integrated approach to the creation of waste management facilities from the idea to implementation will allow the Samara Region to ensure the creation of a modern infrastructure to achieve the target indicators of the national project "Ecology" by 2030 to minimize waste disposal and eliminate unauthorized waste disposal sites in the environment.

In the reporting year, Samara Polytech began work on the creation of a Concept for the Sustainable Development of the Historical Settlement of the City of Samara (a contract with the Department of Urban Development of the Samara City District), which provides for the integration of heritage protection policies into the system of general urban development policies for the development of the urban environment of the historical settlement (hereinafter referred to as HS) of Samara. The main goal of the concept being developed is to improve the quality of life of the population in the context of sustainable and conflict-free development of the historical environment of the city center.

In 2023, a cooperation agreement was signed with Shahid Beheshti University (Iran, Tehran) on joint work on educational, engineering and scientific projects in the field of ecology, chemistry, oil and gas, energy, and information technology. In addition, following the meeting of the Coordination Council of the CIS Network University, a memorandum was signed on the accession of Samara State Technical University to the training program "Heat Power Engineering and Thermal Engineering" and the implementation of a joint program with the South Kazakhstan University named after M. Auezov (Shymkent) - the Kyrgyz State Technical University named after I. Razzakov (Bishkek). At the end of the reporting year, the University joined the consortium "Sustainable Development" on the basis of the Moscow University named after S.Yu. Witte aiming at implementing joint projects to achieve the goals of sustainable development of society and foster a caring attitude towards the environment in society. A promising project is being implemented by the interuniversity research team of Samara State Technical University together with colleagues from the Penza State University of Architecture and Civil Engineering to develop a new effective technology of pressure flotation - wastewater treatment - from oils, oil products and other non-wettable pollutants, increasing the specific productivity of the process by 10% without increasing the cost.

In the reporting year, the strategic project "EcoPromBioTech" is still in progress, it combines two areas: a project to create an industrial technology for the production of microbiological feed protein and a project in the field of environmental safety and recycling. In 2023, work was completed to equip the microbiology laboratory and research began on the selection of producers and components of the nutrient medium, work was completed on the design of the laboratory of single-cell microorganism protein, contracts were concluded for construction and installation work, the purchase of equipment for engineering systems, and the construction of the laboratory began. In 2023, within the framework of the direction 19.03.01 Biotechnology, a new bachelor's degree educational program "Industrial Biotechnology" was opened, 25 students were recruited.

In 2023, work continued on the development of industrial biotechnology to eliminate accumulated damage, solve major environmental problems and dispose of man-made waste. For example, design solutions have been developed and implemented for 1) the reclamation of the territory of the former OJSC Srednevolzhsky Chemical Plant (Chapayevsk) by isolating the source of chemical hazard and 2) the reclamation of the territory of unauthorized disposal of alcohol stillage waste on the territory of the Samarskaya Luka National Park. For the first time, technical solutions have been developed for the creation of anti-filtration curtains to isolate the source of infiltration of hazardous chemical compounds into surface water bodies and the rehabilitation of territories in conditions of limited transport accessibility. The total amount of funding for work aimed at eliminating pollution sources, recycling solid municipal waste, designing treatment facilities and neutralizing waste, including that accumulated as a result of hazardous chemical production, carried out by Samara State Technical University in 2023 amounted to more than 74 million rubles. In the framework of cooperation with industrial partners, Samara State Technical University scientists initiate and carry out scientific research and design work aimed at solving urgent problems in the field of environmental risk management, energy efficiency and rational use of resources, engineering support for the operation of particularly hazardous and technically complex facilities, such as:

- Implementation of a set of design and survey works for the construction of an industrial waste landfill for JSC PNTZ, funding in 2023 is 49 million rubles;

- Design of the project "Design, construction (reconstruction) of the centralized water supply system located in the Samara Region (urban district of Samara, urban district of Novokuibyshevsk, microdistrict of Volzhsky)" commissioned by the State Institution of the Samara Region "Capital Construction Department", financing in 2023 in the amount of 52 million rubles;

- Development of documents for obtaining a Comprehensive Environmental Permit (CEP) commissioned by the Joint-Stock Company "Syzran Oil Refinery", financing in 2023 in the amount of 12 million rubles;

- Provision of services for author's supervision for the project "Adjustment of design and estimate documentation for the project "Reclamation of the territory of the former OJSC "Srednevolzhsky Chemical Plant" (urban district of Chapayevsk)" with the allocation of stage 1 of the work "Isolation of the source of chemical hazard - sludge pit Ш2" commissioned by the Municipal Institution Department of Construction of the Administration of the urban district. Chapayevsk, financing in 2023 1 million rubles;

and other projects, including those commissioned by: PJSC T Plus, JSC Elektroshchit Group of Companies - TM Samara, Volzhskie Kommunalnye Sistemy LLC, PJSC Salut, NNK-Samaraneftegaz LLC, Gorvodokanal LLC, JSC Agregat, INTERREGIONAL ECOLOGICAL COMPANY LLC, ECO-VTOR LLC, PepsiCo Holdings LLC, DANONE RUSSIA JSC, REAVIZ Medical Company LLC.

The volume of R & D financing in the field of environmental management, environmental protection and sustainable development in 2023 increased by 8% compared to the previous year and amounted to over 172 million rubles, including the volume of work performed by the Scientific and Analytical Center for Industrial Ecology and the Institute for Design and Survey Work.

In 2023, new innovative infrastructure facilities were created in the structure of the research department:

- an architectural bureau to solve the problems of the regional project to create a "Concept for sustainable development of the historical settlement of the city of Samara"

- a pharmaceutical research and production center to provide educational activities under the new educational program "Pharmacy", opened in 2023 jointly with the Ozon Pharmaceuticals company, and to conduct R & D in the field of pharmaceuticals, medicine, medical devices and cosmetics and documentary support for all aspects of the activities of pharmaceutical production and the pharmaceutical quality system control department.

In 2023, the following were defended in the dissertation council 24.2.377.05 (1.5.15. "Ecology" and 2.1.4 "Water supply, sewerage, building systems for the protection of water resources" (technical sciences)): 1 doctoral and 3 candidate dissertations. In 2024, 4 defenses for the degree of candidate and 1 doctor of technical sciences are planned.

The updated composition of the expert council in the Higher Attestation Commission (HAC) under the Ministry of Education and Science of Russia in the reporting year included:

- Doctor of Engineering Sciences Andrey Vasiliev - expert council on mineral resources;
- Doctor of Chemical Sciences Andrey Bogomolov - expert council on chemistry;
- Doctor of Chemical Sciences Vladislav Blatov - expert council on chemistry.

In 2023, in the ranking of scientists of the largest international publisher of scientific literature Elsevier, researchers of Samara Polytechnic University were noted for making a significant contribution to world science among 906 Russian scientists, including the director of the International Research Center for Theoretical Materials Science, head of the Department of General and Inorganic Chemistry - Vladislav Blatov (22811 place in the world, 37th place among Russian scientists).

For the first time, 60 Samara State Technical University researchers were included in the AD Scientific Index (Alper-Doger Scientific Index), which covers all areas and subjects of scientific interest and focuses on assessing the added value of scientific productivity of specific scientists.

In 2023, about 400 articles were published in highly rated journals in the field of sustainable development.

Samara State Technical University scientists continue to make valuable contributions and contribute to the formation of sustainable environmental policies and the development of effective environmental protection strategies as members of public councils and working groups under ministries and departments of both regional and federal significance, such as:

- Public Council under the Federal Service for Environmental, Technological and Nuclear Supervision (Ecogolos Charitable Foundation);
- Technical Committee "Waste Management" of the State Standard of the Russian Federation;
- Public Environmental Council on Environmental Safety under the Governor of the Samara Region;
- Public Council under the Ministry of Forestry, Environmental Protection and Nature Management of the Samara Region;
- Public Council under the Department of Urban Economy and Ecology of the Administration of the Samara Urban District;

- Technical Council for the Development of Water Supply and Sanitation in the Samara Urban District;

- Alternative Energy Committee of the world-class REC "Engineering of the Future".

In order to use and commercialize the results of intellectual activity, in 2023, Samara State Technical University submitted applications for an invention, utility model, computer programs and databases in the field of environmental protection and sustainable development, including:

- 4 applications for inventions and utility models: "Device for cleaning the outer surface of pipelines" (patent received), "Method for preparing methane-hydrogen fuel with an increased hydrogen content for boiler units of thermal power plants and a gas turbine expander power plant", "Power generating device", "Device for cleaning a tank";

- 5 applications for a computer program and a database: "A program simulating emergency situations in the process of oil dehydration and desalination", "Determination of the effective thermal conductivity coefficient of porous materials with an ordered structure based on experimental data", "A software package for automatic control of the induction heating process with a limitation on the maximum temperature", "Calculation of the thermal scheme of a two-circuit combined-cycle plant of a utilization type", "Determination of the constant rate of three main reactions of steam reforming of methane based on experimental data", "Approximate analytical method for solving the problem of thermal conductivity in a porous plate, the structure of which is based on triply periodic surfaces of minimum energy", "Database of the composition, cost of equipment and material resources for the construction of a waste sorting station with a capacity of 35-55 thousand tons / year".

In addition, the following intellectual property rights have been obtained:

- 9 patents for inventions: "Method of operation of a combined heat and power plant gas-turbine expander power plant", "Liquid organic hydrogen carrier based on by-products of caprolactam production, method for its production and hydrogen cycle based on it", "Method of gas-saving dynamic braking of high-speed impactors with high kinetic energy", "Device for neutralizing toxic components of flue gases without introducing an external reagent", "Method for purifying artesian water", "Device for purifying artesian water", "Method for neutralizing toxic components of flue gases without introducing an external reagent", "Installation for producing hydrogen by thermal decomposition of methane in a reactor with gas heating", "Method for producing hydrogen-containing fuel gas with electric plasma-chemical and high-temperature conversion of methane and device for its implementation". - patent for utility model "Device for producing hydrogen by thermal decomposition of hydrocarbons in a reactor with gas heating.

Advanced solutions of Samara Polytech were presented at the exhibition of scientific and technical developments of the Ministry of Education and Science of the Samara Region, timed to coincide with the Day of Russian Science:

1. Promising low-carbon technology for producing hydrogen from methane and associated petroleum gas;
2. Technology for safe accumulation and transportation of hydrogen using liquid organic carriers;
3. Intelligent process control system in oil and gas wells
4. Debug board of the local navigation system module, necessary for ensuring fire safety;
5. Mock-up samples of noise mufflers for power plants.

Scientific works of young scientists of Samara Polytech are gaining a high degree of recognition at the national and international levels, which confirms the reputation of the university as a center of innovation and scientific research. Young researchers actively participate in competitions and conferences, presenting original ideas and developments in various fields of science and technology, enriching the scientific contribution of the region. Thus, in the reporting year, the II Conclave of Young Scientists of the Shanghai Cooperation Organization (SCO) member countries was held at the Jawaharlal Nehru Center for Advanced Scientific Research (Bangalore, India). The forum was held in five scientific areas: agriculture and food industry, environmental protection and natural resource management, research and application of artificial intelligence and big data, sustainable energy and energy saving, biology of diseases and healthcare. Samara State Technical University was represented by a senior lecturer of the Department of Chemical Technology and Industrial Ecology with a report on the topic of "Integrated environmental system for assessing and eliminating man-made hydrocarbon deposits."

The Kazan National Research Technological University held the All-Russian Conference of Young Scientists, Postgraduates and Students with International Participation "Food Technology and Biotechnology" in the field of biotechnology, ecology and food safety. A postgraduate student of the Department of Chemical Technology and Industrial Ecology of Samara Polytech presented a report on the topic: "Analysis of Toxicity in the Influence Zone of Wastewater Discharged into the Kuibyshev Reservoir in the Tolyatti Region Using Biotesting Methods", taking third place for research initiative and high level of the report.

In 2023, for the third time, the International Scientific and Practical Seminar "Quality Management" was held at the Engineering and Technology Faculty of Samara Polytech together with colleagues from the West Kazakhstan Innovation and Technological University dedicated to research on quality management issues in the field of electric power engineering. Long-term cooperation with industrial partners and high-tech companies indicates a significant demand for design, project, technological and engineering services of various levels of complexity, including the development of environmentally friendly infrastructure facilities. Thus, in the reporting year, interdisciplinary project teams of Samara Polytech worked on the project of the production space "smart" factory - one of the three components of the "Factory of the Future" project of the National Technology Initiative "Technet 4.0", which will open on the basis of PJSC "UEC-Kuznetsov". The external appearance of the production building, internal technical solutions have been developed, taking into account the requirements of energy efficiency and optimization of the production cycle, using the principles of a "smart building" - a digital system for providing an industrial facility, which will significantly increase the productivity, environmental friendliness and energy efficiency of enterprises. Breakthrough successes in developments aimed at sustainable development play an important role in strengthening the image of Samara Polytech as a leader in the training of environmental specialists. Such achievements not only enhance the university's reputation, but also draw attention to the importance of environmental issues and the need to address them, which in turn contributes to the development of environmental culture and a conscious attitude towards the environment among students and university staff.