

INNOVATIVE ACTIVITY

Zarubezhneft's Innovative Development Program aims to achieve the objectives of the Company's Strategy and LDP by introducing innovative technologies and solutions to achieve the strategic goals that have been set.

Zarubezhneft's updated Innovative Development Program (IDP) for 2020–2024 (with a view to 2030) was developed in accordance with an order of the Government Commission for Economic Modernization and Innovative Development and approved by the Board of Directors in Minutes No. 188 on December 24, 2020

THE HIGHEST IDP AMONG ALL STATE-OWNED COMPANIES

Based on the results of an independent expert evaluation of the quality of the development and implementation of the IDP, Zarubezhneft has consistently received the highest marks among oil, gas, and energy companies with state participation for the development of the IDP in 2016 and for the implementation of the IDP in 2016–2018. In a preliminary quality assessment of the IDP update for 2020–2024, the Company also received the highest score among state-owned oil and gas companies.

99%

The Company's IDP received the highest score among all the state-owned companies that were evaluated

The IDP aims to achieve the following goals:

Growth in the efficiency of current assets development by:

- ▶ Attaining leading positions in the development of carbonate reservoirs
- ▶ Increasing the efficiency of oil and gas field development
- ▶ Increasing oil and gas

Growth in the resource base by:

- ▶ Improving the efficiency of prospecting and evaluation of new assets
- ▶ Searching for promising targets at current assets, including non-structural traps
- ▶ Additional exploration, localization, and involvement in the development of residual reserves through innovative geological exploration methods

Improving the efficiency of production processes by:

- ▶ Improving the efficiency of key business processes and increasing labor productivity
- ▶ Improving the efficiency of decision-making due to the digitalization of the main processes of the Company's activities
- ▶ Improving the energy efficiency and eco-friendliness of production
- ▶ Enhancing the level of the Company's digital maturity

Additional financial result due to the implementation of the IDP.

Innovative technology projects

Key project

Opening

- ▶ Improvement of oil and gas exploration program planning, increased reserves growth, reduced oil and gas exploration costs, and increased opportunities to find prospective areas for drilling

Key project

Smartflooding

- ▶ Development of innovative agents to displace oil from the pore space, including the selection and development of surfactants, polymers, 'smart' water, and gas mixtures

Entalpy

- ▶ Development of innovative technologies for steam injection and thermal gas stimulation, as well as combining these methods with catalytic oil enrichment in reservoirs

Tight Oil

- ▶ Development of innovative technologies for developing low-permeability and unconventional reservoirs, including the Bazhenov suite

Nestro-TEC

- ▶ A set of technological projects aimed at leadership in technology that helps reduce OPEX and CAPEX

Efficient well operations

- ▶ Implementation of innovative technologies and equipment in construction and the reconstruction and repair of wells for any purpose

Digital transformation projects

Key project

Digital field

- ▶ A combination of technological solutions for collecting, transmitting, storing, and analyzing data, and controlling production processes on their basis. Integration of technological solutions within a unified system

Digital assessment of new projects

- ▶ Information environment ensuring the fastest possible search for, evaluation, and integration of new Zarubezhneft projects

Digital office

- ▶ An office environment that allows employees to organize their work in a personalized way from anywhere in the world

Digital expertise of personnel

- ▶ Employees capable to apply digital technologies fully independently at all stages of business processes

The Zarubezhneft portfolio includes

10 innovative projects

THE MAIN CONTRACTORS INVOLVED IN INNOVATIVE PROJECTS IN 2020 ARE DESIGN AND RESEARCH ORGANIZATIONS.

Among the Group

- VNIIneft
- Giprovostokneft

Leading higher educational institutions in the Russian Federation

- Kazan (Volga Region) Federal University (KFU)
- Skolkovo Institute of Science and Technology (Skoltech) and others

Small and medium-sized businesses

and other scientific and industrial organizations

2020 — new stage of IDP

Starting in 2020, Zarubezhneft launched a new stage of the IDP called 'Active Testing of Innovations', which involves a transition to the pilot testing of technological innovations. During this stage, technologies are actively moved "from the laboratory to the field" for the testing of new advanced technologies and solutions to provide competitive advantages to enhance the efficiency of current assets.

Innovative projects

Creation of a power plant that runs on all classes of russian-produced oil

The project was initiated due to the significant costs of purchasing diesel fuel for power generation at JC RUSVIETPETRO fields and difficulties in procuring such fuel.

The project aims to use Russian-made equipment (DVS Kolomna Plant) for oil up to Class 3 (high-viscosity and sulfurous) and increase the overhaul intervals of power machines.

Existing power machines, both foreign-made and those produced by the Kolomna plant, require a high degree of oil treatment and are designed to run on Class 1, light, and low-sulfur oil. Fuel equipment (injection nozzles and the pipeline system) is where the power machines have a bottleneck.

R&D work was conducted in 2017–2020 as part of the implementation of the innovative project to improve power plant equipment units operating on Class 3 oil, develop design documentation, harmonize the power plant with oil industry standards and regulations, and conduct pilot tests at JC RUSVIETPETRO.

The diesel oil power plant was manufactured and delivered to JC RUSVIETPETRO. The power plant underwent pilot tests with diesel fuel, was put into commercial operation, and was adapted to run on oil.

Result

- ▶ In 2020, the R&D project was successfully completed
- ▶ Two patents for inventions were obtained from Rospatent
- ▶ The replication of the project results has begun, and JC RUSVIETPETRO signed a contract for the delivery of the second oil power plant based on the technical specifications that are drafted in 2021

Technology to increase oil recovery at high-viscosity oil fields using the catalytic aquathermolysis method

The technology was initiated in 2017, when the Company, together with KFU, began conducting R&D to design a technology to increase oil recovery at high-viscosity oil fields using the catalytic aquathermolysis method.

The technology aims to intensify the in-situ enrichment of heavy oil in the process of steam-heat processing, which helps to improve oil quality and reduce its viscosity.

The improvement of oil properties in-situ will enhance the energy and economic efficiency of operations at the existing Boca de Jaruco field and potentially other similar fields in the heavy crude oil zone in Cuba and other countries.

In 2017–2018, a series of experiments was conducted at KFU to select the most effective catalyst using the reactor. The nickel catalyst that was selected provides the maximum oil conversion and a significant reduction in viscosity, while the low cost of the nickel catalyst compared with the cobalt catalyst is an additional advantage.

In 2018, the second stage of R&D was completed, during which the remaining research tasks were carried out: evaluation of catalytic activity and catalyst encrustation in aquathermolysis processes, catalyst adsorption on rock (displacement in the combustion tube), a study of solubility, thermal stability, and filtration characteristics of the catalyst solution that was developed. A pilot run of the catalyst for the pilot project was carried out.

In 2019, the catalyst was delivered to Cuba by sea. The Company conducted preparatory work on the pilot project to test the technology as well as the basic Huff and Puff (HNP) of the well candidate (without the presence of the catalyst). In November–December 2019, Zarubezhneft specialists successfully injected the catalyst into the formation and conducted the subsequent HNP.

In 2020, well BKh-3003 was tested in flooding and pumping operation mode (installation of a sucker rod screw pump) with product sampling to study oil properties and confirm the efficiency of in-situ oil enrichment. A total of 190 samples were taken and sent to VNIIneft, and 500 laboratory tests were performed.

Result:

- ▶ The technological efficiency of the method was confirmed, additional production was 102% relative to the base cycle, and the vapor-oil factor was less than 2.8 tons of steam per ton of oil
- ▶ An invention patent for catalytic aquathermolysis technology was obtained jointly with KFU during the reporting year

Pilot project to test technology for the isolation of subsurface formation waters at JC RUSVIETPETRO

Pilot work was carried out in 2020 to test bottom water isolation technology at the Zapadno-Khosedayuskoye oil field.

The technology aims to have an integral impact, which consists of pumping gel-forming composition RV-3P-1 into the watered interval with its subsequent cementation. The gel forms a hydro screen, cutting off the water encroachment cone, as a result of work in the bottom hole zone.

Result:

- ▶ A total of 9 wells were processed
- ▶ Incremental oil production from the implementation of measures in 2020 amounted to 13,000 tons

Pilot project to use diverter technologies at ZARUBEZHNEFT-Dobycha Kharyaga

The project was initiated in 2017. ZARUBEZHNEFT-Dobycha Kharyaga successfully continued to implement the pilot project to use diverter technologies (injection of cross-linked polymer compositions based on polyacrylamide).

The project aims to redistribute filtration flows and reduce well production water cut by blocking highly permeable watered interlayers with polymer composition.

Result:

- ▶ In 2020, ZARUBEZHNEFT-Dobycha Kharyaga treated four injection wells at the Kharyaga oilfield with a gel-forming composition that was developed as a result of research work
- ▶ Total additional oil production for this period is estimated at more than 234,000 tons, including over 94,000 tons in 2020

Financing structure of the IDP in 2020

Total funding for new technology projects and activities, as well as the innovation management system and innovation infrastructure in 2020, exceeds RUB 3.353 billion (table 1), excluding the duplication of financing.

All IDP activities are funded by ZARUBEZHNEFT GROUP.

TOTAL FUNDING OF MEASURES RELATED TO INNOVATIVE DEVELOPMENT IN 2020

Targets and measures	Funding, RUB mln
Innovative projects and measures (process innovations) and R&D	3,198.1
Development of the innovation management system and innovation infrastructure and interaction with outside organizations	155.4 (387.4 ¹)
TOTAL FOR THE PERIOD:	3,353.5

¹ Funding including duplication

Procurement of innovative products and services

SHARE OF REVENUE ALLOCATED FOR R&D FUNDING, %



In 2020, ZARUBEZHNEFT GROUP obtained four patents for inventions and 12 certificates for software, and submitted 12 applications to Rospatent for the registration of the results of intellectual activity. The Group published 32 scientific articles and publications.

■ PROCUREMENTS

Group's procurements in 2020

RUB **32.47** bln

Including

procurements of subsidiaries

RUB **31.15** bln

(96% of all procurements)

Group's innovative procurements in 2020

RUB **892.64** mln

Including

procurements of subsidiaries

RUB **763.94** mln

(85.6% of all innovative procurements)

2.7%

share of procurements of innovative products/services in the total volume of Zarubezhneft procurements

New technology testing and deployment system

In order to effectively manage the processes of testing and introducing new technologies that exist on the market but have not been used ZARUBEZHNEFT GROUP, the Company continued to develop a system for the testing of new technologies, equipment, and machinery in 2020. Testing of new equipment and technologies was conducted in 2020 at the Group's following production facilities: JC RUSVIETPETRO, ZARUBEZHNEFT-Dobycha Samara, ZARUBEZHNEFT-Dobycha Kharyaga, and at the Zarubezhneft branch in Cuba. The testing results confirmed the technological and economic effect, and a number of technologies have been recommended for introduction at the Company's production facilities.

JC RUSVIETPETRO conducted testing in the following key areas in 2020: testing of new chemical compounds for selective isolation, anti-salt buildup in wells, reduction of well construction time, and the reduction of floating oil heat loss during movement through the wellhead fittings. In addition, in order to promptly detect heat losses in inter-field oil pipelines, thermal imaging cameras mounted on unmanned aerial vehicles were tested.

ZARUBEZHNEFT-Dobycha Samara performed work to improve the efficiency of wells that were complicated by asphaltene-resin-paraffin deposits, and tested a new electric plunger pump to improve the efficiency of the low-yield (intermittent) well stock.

In 2020, ZARUBEZHNEFT-Dobycha Kharyaga tested the following: a downhole heating cable with an upgraded sealing device, a multistage fracturing unit on a horizontal well, and thermal shrouds for fuel gas manifolds on a gas turbine unit. Pilot projects were held to test ball valves as part of flowing valves in order to reduce the amount of maintenance. A total of 15 tests were conducted in 2020.

The Zarubezhneft branch in Cuba launched work in 2020 to test the universal configuration of downhole drilling equipment at two horizontal wells for steam injection and oil production with SRPI without conducting current well workovers for the replacement of the downhole drilling equipment.

