

INNOVATION MANAGEMENT

Gazprom Neft's approach aligns technology development projects with strategic goals. The company develops and deploys technological solutions that address strategic challenges.

Focus areas

Technological development is a priority of the Gazprom Neft Strategy 2030. New technology will enable the company to manage large-scale oil production projects effectively and achieve a leading position in strategic areas.

Priority areas of technological development are the following:

- Oil recovery factor increase at mature fields;
- Multiphase fields development;
- Low-permeability reservoirs development;
- Efficient and safe offshore development in the ice-bound sea;
- Efficient refining catalysts and processes.

Each priority area is undergoing development or realization projects, which aimed to design, test or implement necessary technologies.

Basic documents

Upstream Technology Strategy

The Upstream Technology Strategy covers all focus areas of the Upstream Division, including:

- Exploration and resource expansion technologies;
- Well drilling and completion technologies;
- Enhanced oil recovery and well stimulation;

- Development of non-traditional reserves;
- Development of oil rims;
- Electronic Asset Development (EAD);
- Development of carbonate and fractured reservoirs;
- New-generation infrastructure;
- Capital construction.

In 2019, Gazprom Neft updated its Technology Strategy and prioritised flagship technological programmes that will help to achieve the Strategy 2030 goals.

27

projects completed

\$130 billion

billion total portfolio

110 mtoe

mtoe incremental hydrocarbon production by 2025

Offshore Technology Strategy

In 2018, the company approved an Offshore Technology Strategy with the following priority areas:

- Exploration;
- Monitoring, prevention and response to accidents in ice conditions;
- Logistics in the Arctic;
- APG utilisation on the Arctic shelf;
- Offshore field development;
- Safety of offshore projects;
- Digitalisation.

Downstream R&D Strategy

Downstream Research and development is aligned with a long-term R&D strategy. Technological solutions are developed in partnership with Russia's leading research and educational institutions. Technology implementation enables the company to increase the output of high-margin products, depending on technological capabilities of individual refineries, while reducing operating expenses.

The company has about 30 projects in its R&D portfolio:

- Advanced refining processes (high-octane gasoline and needle coke production; tar hydrotreating;

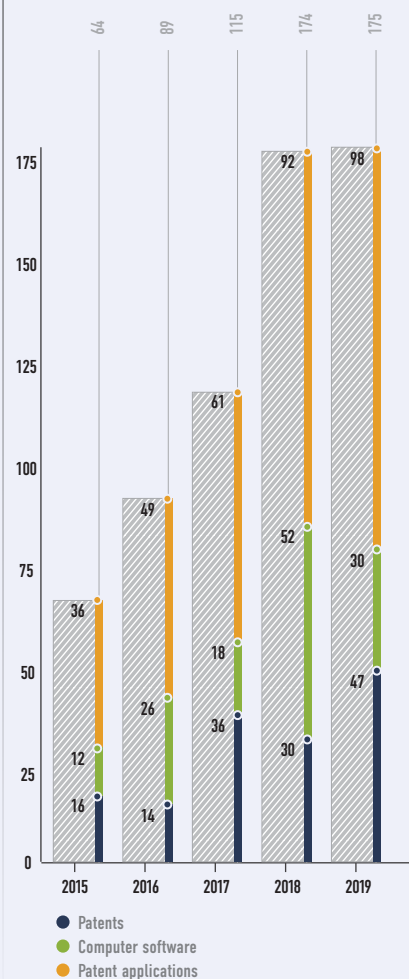
petrochemical production processes);

- Catalyst production technologies, including for catalytic cracking and hydrogenation.

Innovative Development Programme

The company is undergoing an Innovative Development Programme with core focus on enhanced oil recovery at brownfields, hard-to-recover hydrocarbon reserves development, continuous improvement of well productivity, and development and production of catalysts for catalytic cracking and hydrogenation processes. In 2019, investments under the Programme totalled about ₺25 billion, of which R&D costs constituted almost ₺3 billion.

Gazprom Neft intellectual property (IP) portfolio



600^{mtoe}

incremental hydrocarbon reserves by 2025



Innovation infrastructure

Gazprom Neft Science and Technology Centre

The Gazprom Neft Science and Technology Centre (STC) provides analytical, methodological and R&D support for all key production and engineering functions of the Upstream Division. Its science and engineering expertise supports upstream investment and management decisions. Its key competencies include:

- Geological modelling;
- High-tech wells drilling support;
- Science and engineering expertise;
- Integrated field development planning;
- Development and implementation of digital solutions;
- Technology Strategy project management;
- Sharing best practices in technology management.

The STC has over 1,000 employees, who work in St Petersburg and Tyumen offices.

Bazhenov Technology Centre

The Bazhenov Technology Centre is a Gazprom Neft subsidiary established in 2018. It provides an open industry-wide platform

>1.000

employees work in the Gazprom Neft Science and Technology Centre offices in St Petersburg and Tyumen

of collaboration between oil and gas and oilfield service companies, the scientific community, equipment manufacturers, investors and the government. Participants use this platform to test new technologies and equipment, including horizontal well drilling at the Bazhenov Formation, multistage fracking, enhanced oil recovery techniques, software systems, logging tools, and equipment for hydraulic fracturing, oil gathering and treatment.

The Palyanovsky area within the Krasnoleninskoye field in the Khanty-Mansi Autonomous Okrug-Yugra, is the main site of the Bazhenov Technology Centre. Advantages of the asset include compact size, availability of comprehensive geological data and field infrastructure, and commercial flow rates from the Bazhenov formation.

Federal Law No. 396-FZ 'On Amendments to the Law of the Russian Federation on Subsoil as Concerns Improving the Legal Regulation of Relations in the Field of Geological Surveys, Exploration and Extraction of Non-traditional Minerals' was adopted in 2019. The law introduces a new type of subsoil rights, allowing companies to test and validate new technology rather than conduct exploration and production. When the law comes into force, all the relevant regulations are adopted and the licence is renewed, the Palyanovsky area will become the first technology test site in Russia.

The national project on the Bazhenov formation proved the viability of multistage hydraulic fracturing

in horizontal wells. Field tests are conducted to validate increasingly complex drilling and completion technology: longer laterals, more fracking stages per well and higher fluid injection rates. The main goal is to reduce the unit drilling cost to enable commercial oil production from the Bazhenov Formation. Is a commercially viable technology development on the Bazhenov Formation by 2025.

The Bazhenov Technology Centre has started first exploration well drilling and coring at the Savitsky licence block in the Orenburg Oblast. The survey is expected to confirm the presence of moveable hydrocarbons within the intervals of Domanic formations. Commercially viable technologies for Domanic oil production could open the access to a new major source of non-traditional hydrocarbons with the estimated resource base of 3 billion to 6 billion tonnes of oil.

In 2019 the Bazhenov Technology Centre discovered a new Palaeozoic oil deposit at the Urmansky field in the Tomsk Oblast. The discovery has confirmed the presence of oil in deeper Paleozoic horizons and has provided access to pre-Jurassic reserves.

Other oil and gas companies are involved in projects run by the Bazhenov Technology Centre. For instance, in 2019, Gazprom Neft and Zarubezhneft signed an agreement on establishing a joint venture for the exploration, development and production of hard-to-recover oil reserves, including non-traditional hydrocarbons. The joint venture portfolio will include the Salymsky-3 and Salymsky-5

licence blocks located in the Khanty-Mansi Autonomous Okrug, which are currently owned by the Bazhenov Technology Centre.

p. 61 New enhanced oil recovery techniques for the Bazhenov Formation

An Integrated Upstream Engineering Centre (a division of the Bazhenov Technology Centre) was opened at the Skolkovo Institute of Science and Technology in 2019. The new Centre provides R&D support for the development of non-traditional hydrocarbon reserves, including the Bazhenov Formation, Domanic and pre-Jurassic deposits.

The Integrated Engineering Centre specialists have access to the research and engineering infrastructure of the Skolkovo Institute of Science and Technology. Skolkovo's resident organisations, independent business and scientific experts, and venture investors can also be engaged to assist in addressing technological challenges.

Bitumens Research and Development Centre

In 2016, Gazprom Neft established the Bitumens Research and Development Centre, an in-house R&D facility designed to provide R&D support for its bitumen business. The key task of the Centre is to develop bitumen products

technology extending the service life of road coverings.

The R&D Centre has unique laboratory facilities enabling full-cycle research not only on bitumen and its derivatives but also on asphalt concrete mixtures. Given its high level of expertise, the Centre serves as an independent laboratory under the Safe and High-Quality Roads Federal Project in some Russian regions.

Industrial Automation Technopark

The Industrial Automation Technopark was established in Omsk as part of the company's import substitution strategy. It is a platform for research and development, pilot testing and design of high-technology solutions for refinery automation. It comprises training, testing and R&D centres, a data centre, a co-working space (a shared office space), and a communication centre where working meetings and R&D conferences are held.

The Technopark focuses on the development of:

- Instrumentation and controls, such as pressure and temperature sensors, analysers, etc.;
- Automated process control systems, including distributed control systems, accident prevention systems, and software systems;

- Manufacturing execution systems (MES) for dispatching and scheduling; information management systems for laboratories;
- High-technology solutions, including process modelling and optimisation, monitoring and diagnostic systems, and computer-based simulators.

Corporate Information Technology Technopark

The Corporate Information Technology Technopark in St Petersburg is designed to facilitate direct cooperation between technology developers and IT equipment manufacturers for the oil and gas industry. Gazprom Neft provides the participants of the Technopark with a platform for testing and assessing promising solutions and innovative technologies. Regular information sessions are held at the Technopark in order to present potential customers with new IT solutions that proved its effectiveness.

House of Innovations

The Gazprom Neft House of Innovations is a unique cross-functional space for projects involving the use of new end-to-end technologies and data. This project brings together leading specialists in machine learning,

digital platforms, the Industrial Internet of Things (IIoT), blockchain technologies, augmented and virtual reality, and other Industry 4.0 technologies.

New Industry Ventures Fund

In 2019, the company together with Gazprombank, RVC and VEB Innovations established a joint venture fund, New Industry Ventures. The fund will invest in companies specialising in the development

of new materials, technologies, products and services for the oil and gas industry.

The fund's activities will be focused on developing technologies for hydrocarbon exploration, production, processing, transportation, distribution and utilisation, as well as energy transmission and storage,

and on implementing innovative solutions for industrial infrastructure construction and management of large-scale projects. Its investment focus will also include resource- and energy-saving technologies, and digital products, including Industry 4.0 technologies.

Key projects and 2019 highlights

Upstream

As part of a national project to develop technology for the Bazhenov formation Gazprom Neft confirmed the viability of multistage fracking in horizontal wells (see above). The company continued to explore Domanic deposits in the Orenburg Oblast (the Domanic project), develop a technological solution for hydrocarbon prospecting in pre-Jurassic horizons (the Palaeozoic project) and explore the Achimov Formation (see the Resource Base and Production section).

In 2018, the company validated the effectiveness of chemical flooding, a technique that could extend the life of depleted fields in Western Siberia. The Zapadno-Salymiskoye field pilot resulted in a 17 percentage point increase in the oil recovery factor. Commercial-scale

deployment will require lower-cost chemicals. The company plans new surfactant-polymer compositions testing at the Kholmogorskoye and Sutorminskoye fields in the coming years.

Miscible displacement technology, which proved high efficiency during laboratory tests, will enable the company to achieve incremental production at fields with a high gas/oil ratio. In 2020, the company plans surface infrastructure construction to implement this technology at the sites.

Digital tools implementation enhance Gazprom Neft key competencies (geological evaluation, drilling, production and construction management) through faster and more efficient decision-making. For instance, the company has achieved incremental oil production

at the Vyngapurovskoye field during pilot tests, using digital system recommendations. The system was designed to identify oil-bearing intervals. A machine-learning model is used to process geological data and identify promising formations that have not been detected using conventional methods due to their small size or complex structure. The company will be able to boost production without extra costs on infrastructure by rolling out this technology across its sites.

Gazpromneft-Yamal has tested self-learning software designed to predict changes in rock types in the course of drilling. The system alerts the operator to the possibility of exiting the pay zone, which enables real-time drilling trajectory adjustment.

Refining

Gazprom Neft has implemented Captain, a digital logistics management system for projects in the Arctic. This system enables uninterrupted oil shipments from Prirazlomnoye and Novoportovskoye fields. Gazprom Neft produces aluminium oxide catalysts for deep conversion, and develops efficient catalytic-cracking, hydrotreatment and hydrocracking catalysts as part of a national project. A state-of-the-art catalyst plant is under construction in Omsk.

Gazprom Neft's strategic priority is to develop refining processes that deliver unmatched efficiency. These include the Aroforming technology that allows low-grade feedstock (straight-run gasoline) processing into high-octane motor gasoline component. The testing was successfully completed in 2019, and the company is developing plans for this technology commercialising.

Another priority for the downstream segment is new products manufacturing technologies development, such as needle coke and unleaded aviation

gasoline. The first pilot batch of premium-grade needle coke was produced at the Omsk Refinery in 2019. The technology used in its production is an R&D result patented by the company. This product is used to manufacture ultra-reliable graphitised petroleum coke cathodes, which are used in the metals industry. The company also develops processes to convert heavy feedstock, such as tar, asphalt or pyrolysis resin, into high-quality bunker fuel that comply MARPOL 2020 standards, or into raw materials for hydrocracking and catalytic cracking facilities.

IMPORT SUBSTITUTION

One of Gazprom Neft priorities is to increase the share of Russian products in procurement structure. The company implements solutions available on the market and supports the development of new products to achieve this goal. Substantial part of import substitution projects are implemented by partnering companies.

Seismic surveys at the Ayashsky licence block in the Sea of Okhotsk

is an example of import substitution in practice. During these surveys, Gazprom Neft has become the first oil company in Russia to use the domestically produced standalone "CRAB" seabed station for seismic surveys. Previously, these surveys were largely conducted using the foreign equipment.

The seabed stations development is an example of successful partnership between Gazprom Neft,

the government, domestic technology developer and equipment manufacturer, and a Russian service company. Its outcomes prove that Russian companies are able to take on complex technological challenges and produce solutions promptly. The company also implements a number of other joint projects to create domestic technologies for offshore exploration and production.

