

# INNOVATIVE ACTIVITIES

ONE OF THE PRIORITIES FOR GAZPROM NEFT'S INNOVATIVE DEVELOPMENT IS TECHNOLOGY THAT ENSURES THE STRATEGIC GOALS OF A PROFITABLE INCREASE IN PRODUCTION AND ENHANCES THE TECHNOLOGICAL EFFICIENCY OF OIL REFINING.

The Company studies and creates effective solutions jointly with market leaders while adapting them to the conditions of its specific assets. At the same time, the Company is developing a technology market by encouraging partners to create new breakthrough solutions buyer. Unique solutions that are not available on the market are developed by the Company together with domestic and foreign partners.

The Company has an Innovative Development Programme whose foundation includes introducing technologies that enhance well productivity, developing the Bazhenov formation, improving tertiary methods for increasing oil recovery at depleted fields as well as developing and manufacturing catalysts for refining. Projects to digitize manufacturing in the oil production, refining, and sales segments are also an important part of the Innovative Development Programme.

RUB **3.7** BN

INVESTMENT  
IN THE INNOVATIVE  
DEVELOPMENT PROGRAMME  
IN 2017

## MAIN COMPONENTS OF THE COMPANY'S INNOVATIVE INFRASTRUCTURE

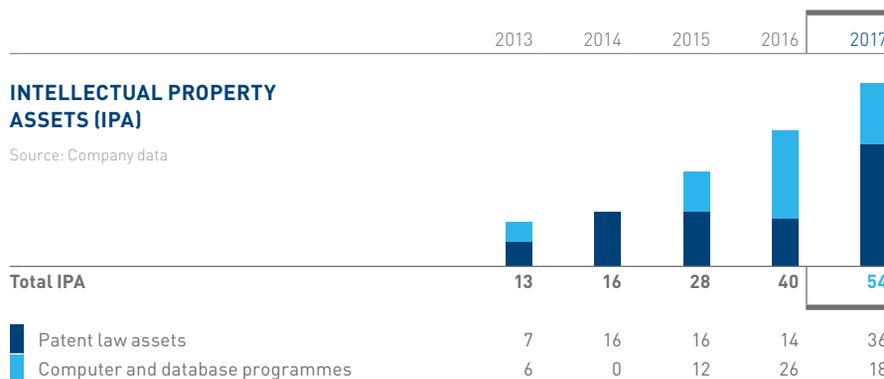
### EXPLORATION AND PRODUCTION

- **Gazpromneft Science and Technology Centre LLC** – provides analytical, methodological, scientific, and technical support for all key production and technical functions of the Upstream Division.
- **Upstream Control Centre** – manages hydrocarbon production using 'digital twins' of fields – virtual models that change based on regularly updated information from sensors at the sites. 'Digital twins' enable Gazprom Neft to foresee possible technical and technological complications that may occur, help to make optimal decisions concerning equipment repairs, and thus reduce the operating costs of facilities.
- **GeoNavigator Drilling Control Centre** – handles round-the-clock monitoring, control, and remote engineering support during the process of building high-tech wells at the Company's fields.
- The **Cognitive Geologist project** involves the creation of a self-learning model for a geological site. This makes it possible to reduce the analysis time from two years to several months, create thousands of options for developing a field, and choose the best one.
- **Cognitive Engineering project** – using artificial intelligence to analyse big data allows for calculating optimal solutions in conditions of high geological, technical, and economic uncertainties.
- The **Electronic Asset Development (EDA) system** aims to develop IT projects in exploration and production. It is part of the technology strategy of Gazprom Neft and is one of its key focuses. The EDA currently includes more than 30 projects.

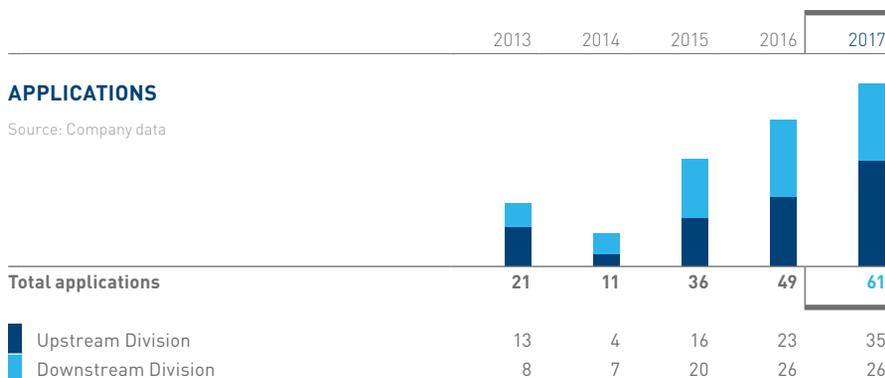
## REFINING AND SALES

- **Digital Innovation Centre<sup>1</sup>** – was established to search for and introduce technological solutions for work with big data, predictive management, and the creation of digital twins for infrastructure. The Centre’s job is to develop innovative digital products in order to further enhance Gazprom Neft’s unified technological platform in logistics, refining, and sales.
- **Gazprom Neft Industrial Automation Technopark** (Omsk) – a platform for the development and testing of high-tech solutions in oil refinery automation.
- **Downstream Efficiency Control Centre** – encompasses the management of the value chain, production, equipment reliability, and the oil control system and also supports the transition to a completely predictive model of production management.
- **Digital Refinery project** – part of a Gazprom Neft project to create Russia’s first unified digital platform for the logistics, production, and sales of petroleum products. The digital platform will integrate, store, and process data online by providing a visualization of changes in key production parameters.
- **Oil Control system** – provides analysts with up-to-date and reliable information about the production and movement of oil and petroleum products during all stages: from the refinery to the filling station, refuelling complex at the airport, or a berth.
- **Digital Filling Station project** – ensures the centralized management of the Company’s automated filling stations from a single dispatch centre in Yaroslavl, where all the parameters of equipment operation and quality of oil products are monitored in real time.
- **Digital Refuelling Complex project** – a pilot project to introduce automation during the aircraft fuelling stage was implemented at one of Europe’s largest airports – Moscow’s Sheremetyevo, which is currently testing the first tanker equipped with an automated commercial metering module. The refuelling process is also almost completely automated now. The operator of the refuelling truck signs in with a smart card and enters data about the required amount of fuel. All the necessary information about the fuel supply parameters and mode is displayed electronically online during the refuelling process. Once the required volume is reached, the system automatically stops fuelling, the printer prints out a receipt, and a refuelling report is sent to the Gazpromneft-Aero server using a GSM module. The automated commercial metering of aviation fuel will make it possible to send airlines an invoice and monitor receivables online. The installation of new modules will become an important component in the strategic project to establish full commercial metering, which will not only change the company’s IT landscape, but the very principles of how it does business in many respects.
- **Digital Sales project** – this helps to fine-tune the product and service offering for each customer in any of the sales channels, quickly create and bring new products and services to the market, and provide consumers with instant access to the necessary solution.

Gazprom Neft’s key partners in the development and introduction of technologies: Institute for Hydrocarbon Processing Problems and the Institute of Catalysis of the Siberian Branch of the Russian Academy of Sciences, Topchiev Petrochemical Synthesis Institute of the Russian Academy of Sciences, Skolkovo Institute of Science and Technology, the Engineering Centre of Moscow Institute of Physics and Technology, Gubkin Russian State University of Oil and Gas, Tyumen State University, National Intellectual Development Foundation, Yandex.Terra, and Shell.



<sup>1</sup> — Opened in April 2018.



**RUB 980 MN**  
INVESTMENT IN R&D IN 2017

## Digital transformation

**One of the most important aspects of Gazprom Neft's development strategy is the digital transformation of its business.**

New generation production management systems are being created in all segments of the Company's activities. They ensure the integrated management of all services to maximize the value of assets, the use of digital twins to optimize operating modes and maintenance plans, and the development of a corporate knowledge distribution system. Projects are being implemented at all stages of the value chain, from extracting enterprises to the sale of petroleum products.

"We have already established a digital ecosystem that encompasses all aspects of our work: from geology and extraction to the knowledge dissemination process within the company. Our priority is to create electronic advisers and cognitive assistants that will process information and perform calculations in order to offer engineers ready solutions to take further action".

**Mars Khasanov**

Head of the Technology Directorate and CEO of the Gazprom Neft Science and Technology Centre

## EXPLORATION AND PRODUCTION

The Company has employed a Technology Strategy in exploration and production since 2014 that consolidates its technological challenges in priority areas. Key technological challenges include incorporating hard-to-recover and unconventional hydrocarbon reserves into development, increasing oil recovery at mature fields, boosting drilling efficiency, and developing carbonate and fractured reservoirs. A long-term technology programme has been developed for each focus of the Technology Strategy and projects are being implemented to solve the technological challenges.

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**PROJECTS**  
IMPLEMENTED AS PART OF THE TECHNOLOGY STRATEGY IN 2017

The Management Committee chaired by the Company's First Deputy CEO is in charge of managing the implementation of the Technology Strategy.

## MILESTONES OF THE YEAR

- The drilling of two horizontal wells with multi-stage hydraulic fracturing at the Palyanovskaya area in 2016 resulted in a commercial oil flow from the Bazhenov formation. The MSHF GROWTH software developed by the Company as part of a research consortium in 2017 was tested at the wells of the Bazhenov formation. This solution – the world’s first hydraulic fracturing simulator in the conditions of the Bazhenov formation – makes it possible to simulate the formation of cracks in the reservoir, predict the oil flow, and select the optimal hydraulic fracturing parameters.
- Gazprom Neft and the Government of the Khanty-Mansi Autonomous District agreed to establish a technology development centre for production from the Bazhenov formation in the Khanty-Mansi Autonomous District – the Bazhen Technological Centre. The centre, which is a new legal entity with the status of a technological testing site, is scheduled to open in 2018.
- The active phase of the pilot project for soda-surfactant polymer flooding at the West Salymkoye field is close to completion. The project resulted in a 15% increase in oil recovery, which indicates the new solution has a high level of technological efficiency.
- Gazpromneft-Khantos launched the Upstream Control Centre (UCC), which was established as part of the Digital Field programme. The Centre consolidated previously developed solutions to increase the efficiency of individual extraction processes into a unified integrated environment. The Centre will reduce operating costs by 15%.
- The Hydraulic Fracturing Scientific and Technical Support Centre was established in partnership with the Engineering Centre of Moscow Institute of Physics and Technology.
- The well design was optimized at the Tsarichanskoye field. A project was successfully implemented to utilize a dual-shaft design for the first time in Russia as well as a set of technological solutions (geomechanics, foam cementing) that made it possible to carry out drilling and cementing in conditions of disastrous drilling mud losses. Seventeen wells were drilled using this approach. Total savings exceeded the project’s cost by more than four-fold. Total drilling costs were reduced by more than RUB 840 million.
- The Company worked on creating a set of IT solutions for the ‘Cognitive Geologist Assistant’, which will boost the efficiency of preparing geological solutions by several times, more than double the speed of data processing, and reduce the cost of extracting information by a third.

### THE FIRST IT PLATFORM FOR SEISMIC EXPLORATION

**In 2017, Gazprom Neft, in collaboration with Yandex. Terra, Pangea, and the Moscow Institute of Physics and Technology,** began building Russia’s first integrated platform for the processing and interpretation of seismic data that can accompany the whole cycle of seismic studies – from setting goals to completing projects. The software will be able to solve problems ranging from selecting promising sites and interpreting data to suggesting ideas for creating seismic geological models. In the future, the prototype will be supplemented with algorithms to process big data and make decisions. The new software products are being developed as part of the Electronic Asset Development (EDA) programme. The program encompasses all major areas of the Company’s operations in the upstream segment: exploration, drilling, development, production, and the development of fields.

“In today’s oil and gas industry, decision-making is based on data that is growing exponentially in volume. The Big Data paradigm allows for adapting business strategies for such explosive growth rates, while modern methods of data analysis, such as machine learning and convolutional neural networks, make it possible to take a fundamentally new approach to solving pressing problems”.

#### **Timur Tavberidze**

CEO of the Engineering Centre of Moscow Institute of Physics and Technology

## OIL REFINING

The oil refining segment employs a long-term R&D strategy as part of which a portfolio of innovative projects has been established in the priority areas of technological development. Introducing their results at the Company's refineries will increase the yield of high-margin products given the technological conditions of a particular refinery and also reduce operating costs.

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**R&D PROJECTS**  
IMPLEMENTED IN 2017

### MILESTONES OF THE YEAR

- The Downstream Efficiency Control Centre (ECC) was established within the Downstream Division. The Centre's objective is to build a unified digital platform to manage the efficiency of the value chain from oil supplies to the refinery to the sale of petroleum products to the end user. A total of 250,000 automated monitoring sensors and dozens of production processes management system transmit information in real time about the demand for petroleum products, the state of equipment, and the quality of raw materials to the ECC. The Centre has created a 'data lake' where management decisions are made based on an analysis of the data. The Centre will have a significant economic impact by optimizing all processes and enhancing the reliability of production.
- Gazprom Neft successfully introduced its own catalysts and technological solutions as part of a project to develop the production of catalysts for oil refining:
  - catalytic cracking: the new brand of Avangard catalysts in which the catalytic cracking unit increases the yield of petrol by 3.7%;
  - oligomerization: the new KOB-1 catalyst increased service cycle duration by two-fold and the yield of the high-octane component of petrol by 30%;
  - isodewaxing: the new catalyst without precious metals ensured the production of winter and Arctic grade diesel fuel in accordance with the production programme;
  - new process for the reactivation of the diesel fuel hydrotreating catalyst: the Omsk Oil Refinery efficiently operated the reactivated catalyst for a year instead of the planned six months, thus reducing expenses on the purchase of a fresh catalyst by 55%.
- The Company concluded general agreements until 2025 on matters concerning the development catalysts for oil refining with its strategic scientific partners – the Boreskov Institute of Catalysis (Novosibirsk) and the Institute for Hydrocarbon Processing Problems of the Siberian Branch of the Russian Academy of Sciences (Omsk).

### Solid acid alkylation

In 2017, the project committee under the Ministry of Energy of the Russian Federation approved Gazprom Neft's project to create an environmentally safe solid acid alkylation technology – an innovative waste-free technology for the production of the high-octane component of Euro 5 petrol. The commercial introduction of the technology at the Moscow Oil Refinery will ensure the production of more than 100,000 tonnes of alkylbenzene per year. The Company completed construction on Russia's first pilot plant for solid acid alkylation with capacity of 300 tonnes of products per year as part of a project in Elektrogorsk.

“The process proposed by Gazprom Neft specialists provides unique advantages in terms of working in a non-corrosive environment, obtaining a higher octane number, and lower capital costs than in plants with mineral acids”.

#### Yury Zlotnikov

Director of the Oil and Gas Refining Department,  
Russian Ministry of Energy