The importance of flexibility for modern refineries (interview)

Value chain as a single asset

The digital transformation of the Gazprom Neft Downstream Division aims to manage the entire value chain as a single asset. The transformation is focused on the key tasks of optimising resources, minimising losses and increasing efficiency at each stage, as well as improving the safety, reliability and environmental performance of assets. The practical application of this concept is based on developing end-to-end digital solutions covering the entire value chain and creating digital ecosystems to increase efficiency in each segment of the chain.

As part of this approach, a single and cohesive database is being created for the downstream segment, which will ensure the high quality and availability of all performance indicators and analytical and business information to meet the needs of the entire value chain.

The Gazprom Neft Neftekontrol ('Oil Control') System is an end-to-end operational efficiency tool for the downstream segment. It was developed in-house to continuously monitor and control the volume and quality of oil products at various stages, from the refinery to the customer.

Smart sensors and systems monitor key qualitative and quantitative metrics of all petroleum product flows in real time, sending information to the Neftekontrol System. System tools build a digital model of the movement of petroleum products, identifying potential risks, and improving performance along the chain by forecasting and reducing the risks of petroleum-products losses. The Ministry of Energy of the Russian Federation and the Federal Agency for Technical Regulation and Metrology (Rosstandart) have recognised Neftekontrol as the industry standard for the fuel traceability system for all state market participants.

Today, 90% of Downstream assets are connected to this unique system. This oversight and control system is expected to be deployed across all assets in the company's value chain by 2020, including all of Gazprom Neft's refining, logistics and retail facilities.

Neftekontrol is linked to another end-to-end solution that affects the efficiency of the value chain: **an integrated scheduling system.** Covering the entire value chain, the system generates an optimum plan for production and distribution of oil products on a daily or monthly basis. By 2021, the integrated scheduling system will cover all Gazprom Neft's downstream assets and, as a result, planning accuracy will increase to match the global benchmark of 97–98%.

The overall integration of these two systems takes place at the Gazprom Neft's Downstream **Efficiency Control Centre (ECC).** By leveraging modern data analysis technologies, predictive analytics methods and working with big data, the ECC enables the company to maximise the operational efficiency of all processes in the value chain. A single and cohesive environment for managing refining assets makes it possible to implement solutions that increase the efficiency and reliability of the entire production process hierarchy, from basic processes to groups of production facilities and entire enterprises.

The Arctic is a strategically important region for the whole of Russia and, in the oil supply segment, Gazprom Neft is the first among Russian companies to create a **Digital Arctic** ecosystem to manage logistics there effectively.

The company's refining assets have reached a level of digital maturity, such that a transition to a new production-management model is assured. Gazprom Neft continues to develop new approaches, based on the smart management of process units, to utilise the most innovative digital tools and manage its production assets. The creation of the **Production Control Centre (PCC)** is a prime example of the new management model. An initial pilot project at the Omsk Refinery will take over operational production management, including control over daily plan fulfilment, product quality, energy consumption, equipment status assessments, and the monitoring of industrial and environmental safety.

The new centre will be built around the work of cross-functional teams, united in a cohesive environment of IT tools and big data analytics systems. Thanks to the implementation of "digital twins" – precise mathematical models of all of the refinery's technological facilities and complexes – the PCC will be able to predict and to eliminate, proactively, any deviations from optimum operation and integrated planning. The pilot project will be implemented at the Omsk Refinery in 2020 at the Moscow Refinery by 2021. The Production Control Centre will become a part of the "digital refinery of the future", which will be managed from a single control centre, using digital tools running on a single platform.

First Russian industrial control system

In 2019, a methyl tert-butyl ether (MTBE) production unit was commissioned at the Gazprom Neft Moscow Refinery, where a sophisticated domestically-designed process control system was used for the first time. The design of the automated system piloted at the Moscow Refinery takes into account the requirements of local production processes, and complies with industrial safety requirements. The new automated process control system allows the company to achieve its strategic objective of increasing its share of domestically-designed solutions relating to production automation.

« The establishment of production control centres at refineries is another major step in transforming the company's downstream business. We are building a new system that will enable us to manage the business as a single asset. The system uses real data, algorithms, mathematical models and state-of-the-art digital systems.

Anatoly Cherner
Deputy CEO for Logistics, Refining and Sales, Gazprom Neft PJSC

Automated fuel-loading system at the Moscow Refinery

An automated light-products loading terminal for road tankers with a daily capacity of 6,500 tonnes was commissioned at the Moscow Refinery in 2019. The complex includes 12 stations with the ability to dispense, simultaneously, gasoline, diesel and aviation fuel into road tankers. Technological solutions used at the terminal significantly increase its throughput, which in turn reduces loading times.

Modern environmental technologies and control systems at the terminal help to maintain the highest level of environmental safety. The new loading terminal is equipped with a vapour-recovery system that collects escaping vapours and turns them into liquid condensate that is then reused in the production cycle. A completely leak-proof bottom-loading system provides additional protection, as it prevents any emissions of petroleum products into the atmosphere, and prevents dust or precipitation from entering tanker compartments. All loading stations are equipped with the latest accident prevention and fire-fighting systems.

₽2.5 billion

investments

6,500 tonnes

daily throughput

4×

faster loading

From the very start, the new fuel-loading terminal was designed to meet key requirements: the highest possible safety standard, zero impact on air quality, high-speed processes, and continuous quality control. Thanks to new technology, we are improving production efficiency while reducing the environmental footprint.

Vitaly Zuber
General Director
of the Gazprom Neft
Moscow Refinery

Development of NIS: a decade with Gazprom Neft

2019 marked the tenth anniversary of Gazprom Neft's acquisition of a controlling interest (56.15%) in a Serbian oil and gas company, Naftna Industrija Srbije (NIS). At that time, NIS was a national oil and gas company with debt exceeding $1 billion and whose enterprises required immediate and large-scale upgrades.

Gazprom Neft's principal investment project in Serbia concerned the construction of a mild hydrocracking and hydrotreatment complex at the NIS refinery in Pančevo. In addition, the company's retail network has been extensively overhauled. All the company's filling stations were rebranded as NIS Petrol and, in 2012, the premium Gazprom brand was introduced. More than €3 billion in total has been invested in developing NIS over the past 10 years.

Today, NIS is one of the most important energy companies in south-east Europe, owning one of the best state-of-the-art refineries in the region, and managing a filling station network across Serbia, Romania, Bulgaria, and Bosnia and Herzegovina. Apart from developing oil production and its own power generation, the company is the leading supplier on the domestic fuels market and exports oil products to markets throughout the Balkans. It provides a workplace to over 11,000 people and contributes over €1 billion per year to the Serbian budget. Power generators with a total installed capacity of 14 MW operate across the company's eight oil and gas fields.

By 2025, a further €1.4 billion will be invested in the development of NIS, including over €800 million to be allocated to oil and gas exploration and production, €400 million to refinery upgrades and development, and €150 million to developing the sales network. The second stage of the refinery modernisation will see the construction of a deep conversion complex, which will put the Pančevo refinery on a par with the world's leading refineries in terms of technology and efficiency. Once the complex goes into operation, the refinery will cease production of high-sulphur fuel oil, with the conversion rate reaching 99.2%. In addition, NIS will begin producing coke, which is not currently produced anywhere in Serbia.

NIS is implementing a joint power-generation project together with Gazprom Energoholding. It involves building a cogeneration power station of combined steam-and-gas cycle in Pančevo, with a capacity of up to 200 MW. The new plant is scheduled to be operational in 2020.

>€3 billion

invested by Gazprom Neft in NIS development between 2009 and 2019

€1.4 billion

planned investments until 2025

1.2 mtoe

annual hydrocarbon production

14 MW

installed capacity

NIS to invest €72 million to upgrade its production facilities

Implementing alternative energy technologies at the Omsk Refinery

Gazprom Neft has successfully implemented a pilot alternative energy project at the Omsk Refinery: the company has built and commissioned a one-megawatt solar power plant in record time.

The new power station, occupying a two-and-a-half-hectare plot and comprising 2,500 solar panels, meets the Omsk Refinery's full energy requirements for all of its administrative buildings, including a standalone amenities building for 2,600 employees. Given the amount of sunshine in Omsk, the annual electricity output from the photovoltaic power plant is likely to be 1.2 gigawatt hours (GWh).

By introducing renewable energy technologies, the refinery will improve its energy efficiency and environmental performance. This will be achieved by providing the Omsk Refinery with additional generation while reducing its dependence on external energy suppliers, as well as by utilising land not otherwise involved in the technological process.

2,500
solar panels

1.2 million kWh
annual output

1 MW
capacity

Our ambition is to develop a fully-fledged company-wide energy business, using the latest energy technologies and creating synergies with its traditional business. The development of the energy business will focus on captive power generation using renewable and innovative energy sources, establishment of a power engineering centre, and intelligent energy management solutions based on digital technologies. Gazprom Neft refineries will become well-balanced energy hubs serving as benchmarks in terms of reliability and energy efficiency.

Vladimir Andreev
Head of Department for Power Engineering, Gazprom Neft PJSC

Company refineries: 2019 highlights

Refinery	Installed capacity, mt	Volume refined in 2019, mt	Conversion rate, %	Light-product yield, %
Omsk Refinery	22.23	20.72	89.5	70.6
Moscow Refinery	12.76	10.08	81.6	59.3
NIS Pančevo Refinery (Serbia)	4.60	3.14	81.5	77.4
Slavneft-YANOS	15.00	7.53	65.3	54.5
Mozyr Refinery	14.03	0.00[1]	79.8	60.5

/ 1 / Gazprom Neft's share in the Mozyr Refinery's refining volumes is subject to the oil supply schedule as approved by the Ministry of Energy of the Russian Federation. The company may process up to 50% of oil supplied to the refinery. Actual refining volumes will depend on its economic efficiency. The company did not process any of its oil at the Mozyr Refinery under tolling arrangements in 2019.

Modernisation and technological developments

key projects implemented in 2019	key projects scheduled for 2020
– Commissioning a cat-cracking regeneration gas treatment unit; – Completing the reconstruction of the diesel-fuel hydrotreatment unit, delivering a 10% capacity increase; – Commissioning the first (1 MW) solar-power electricity station in the region; – Implementing the second stage of refinery modernisation, including the construction of a crude oil distillation unit (CDU/VDU), a deep conversion complex (DCC), a delayed coking unit (DCU), a diesel-fuel hydrotreatment/dewaxing unit, and the Biosphere treatment facility.	– Continuing the implementation of the second stage of the modernisation; – Completing the reconstruction and commissioning a number of process units, including the catalytic reforming unit.
– Commissioning an air-tight and leak-proof road-transport loading rack for light oil products; – Completing the main construction and installation works at the Euro+ unit, starting pre-commissioning works.	– Commissioning of the Euro+ combined oil refining unit; – Active phase of construction of the automated railcar oil-products loading facility.
– Completing the construction of a deep conversion complex based on delayed tar coking technology.	– Commissioning the deep conversion complex; – Reconstruction of the catalytic cracking unit, and construction of an ethyl-tert-butyl ether (ETBE) unit.
– Commissioning of the "Wet Catalysis – 2" hydrogen sulphide removal unit; – Converting the hydrogen production unit (UPV 2) to natural gas; – Continuing the construction of the deep conversion complex.	– Continuing the construction of the deep conversion complex; – Continuing the upgrade of the VT 6 vacuum distillation unit; – Completing the reconstruction of the gas-loading rack.
– Construction of the hydrocracking unit for heavy oil residues.	– Completing the construction and installation of the hydrocracking unit for heavy oil residues and initiating start-up works.