Global oil market: digital technologies application to strengthen the position of Russia

Abstract. The modern oil market is characterized by instability and high competition. Depletion of oil fields, depreciation of equipment for oil production, price instability and political conflicts have a negative impact on the position of Russia at the global energy market. At the same time, the world entered an era of a new technological revolution that did not pass by the oil industry. In particular, the concept of digital production is spreading and implementing.

The aim of the work is to study the place and role of the Russian Federation in the world oil market and the possibilities of using digital technologies in this sector of the world economy. The information base for the analytical study were statistical data from official sources: the Centre for Macroeconomic Analysis and Short-term Forecasting (CMASF), the Ministry of Economic Development of Russia, Ru-Stat, the Analytical Centre for the Government of the Russian Federation. Significant statistical and analytical information has been received from the strategic reports on Gazprom Neft and the LUKOIL oil companies.

Along with discussion of the state and significant changes in the oil production and refining market at the present stage, the study analyzes the potential and real mechanisms of digitalization of the industry in Russia in order to reduce transaction costs. Thus, to achieve the goals of the Rosneft-2022 strategy, the company has signed an agreement with General Electric on the creation of a joint venture focused on the introduction of modern digital technologies and new industrial Internet standards. Gazprom Neft implements a strategy on the digital products development named «Electronic development of assets» («ERA»), designed to ensure the operational management of key production stages. «ERA» is among main instruments of complex and widespread digitalization of business at all levels of estimating field costs, production and management. The concept of an intellectual field (LIFE-Field), implemented in the oil company «LUKOIL», is to integrate the field management processes based on automated computer systems and high-tech data collection systems. A key component of the digital production concept is the use of certain software that allows all employees of the oil sector to carry out their activities more quickly and efficiently, while reducing industry operating costs.

Keywords: World Oil Market; Oil Production; Oil Refining; Oil Price; Digital Production; Gazprom Neft; LUKOIL; Rosneft; Russia; Power; Capitalization; Information Technology; Digital Technology

JEL Classification: F23

Acknowledgements and Funding: The authors received no direct funding for this research.

Contribution: The authors contributed equally to this work.

DOI: https://doi.org/10.21003/ea.V180-12
Світовий ринок нафти: застосування цифрових технологій для зміцнення позиції Росії

Анотація. Актуальність дослідження полягає в тому, що сучасний ринок нафти характеризується нестабільністю та високою конкуренцією. Виснаження нафтових родовищ, знос устаткування для видобутку нафти, нестабільність цін і політичні конфлікти негативно впливають на позиції Росії на світовому енергетичному ринку. У той же час світ вступив в епоху нової технологічної революції, яка не обійшла стороною і нафтову галузь. Зокрема, поширення та впровадження отримує концепція цифрового виробництва.

Метою роботи є вивчення місця й ролі Російської Федерації на світовому ринку нафти та можливостей застосування цифрових технологій у цьому секторі світового господарства.

Вихідними матеріалами для аналітичного дослідження стали статистичні дані з офіційних джерел, до яких належать: Центр макроекономічного аналізу й короткострокового прогнозування, Міністерство економічного розвитку Росії, Ru-Stat, Аналітичний центр при Уряді Російської Федерації. Значну статистичну і аналітичну інформацію було одержано зі стратегічних звітів про «Газпром нафту» й нафтову компанію «ЛУКОЙЛ».

Поряд із обговоренням стану й істотних змін ринку нафтодобутку та переробки на сучасному етапі, у дослідженні проаналізовано потенціал і реальні механізми цифровізації галузі в Росії з метою зменшення операційних витрат. Розглянуто концепцію інтелектуального поля (LIFE-Field), реалізовану в компанії «ЛУКОЙЛ», яка полягає в інтеграції процесів управління полем на основі автоматизованих комп’ютерних систем і високотехнологічних систем збору даних.

Ключовим компонентом концепції цифрового виробництва є використання певного програмного забезпечення, яке дозволяє всім працівникам нафтового сектору виконувати свою діяльність швидше й ефективніше, зменшуючи операційні витрати галузі.

Ключові слова: світовий ринок нафти; нафтодобуток; нафтопереробка; ціна на нафту; цифрове виробництво; «Газпром нафта»; «ЛУКОЙЛ»; «Роснафта»; Росія; енергетика; капіталізація; інформаційні технології; цифрові технології.

Мировой рынок нефти: применение цифровых технологий для укрепления позиции России

Аннотация. Актуальность данного исследования заключается в том, что современный рынок нефти характеризуется нестабильностью и высокой конкуренцией. Истощение нефтяных месторождений, износ оборудования для добычи нефти, колебание цен и политические конфликты негативно влияют на позиции России на мировом энергетическом рынке. В то же время мир вступил в эпоху новой технологической революции, которая не обошла стороной и нефтяной отрасли. В частности, распространение и внедрение получает концепция цифрового производства.

Целью работы является изучение места и роли Российской Федерации на мировом рынке нефти и возможностей применения цифровых технологий в этом секторе мирового хозяйства.

Исходными материалами для аналитического исследования стали статистические данные из официальных источников, коими являются: Центр макроэкономического анализа и краткосрочного прогнозирования, Министерство экономического развития России, Ru-Stat, Аналитический центр при Правительстве Российской Федерации. Значительная статистическая и аналитическая информация была получена из стратегических отчетов о «Газпром нефти» и нефтяной компании «ЛУКОЙЛ».

Наряду с обсуждением состояния и существенных изменений рынка нефтяных и переработки на современном этапе, в исследовании проанализирован потенциал и реальные механизмы цифровизации отрасли в России с целью уменьшения операционных издержек. Рассмотрена концепция
интеллектуального поля (LIFE-Field), реализованная в компании «ЛУКОЙЛ», которая заключается в интеграции процессов управления полем на основе автоматизированных компьютерных систем и высокотехнологичных систем сбора данных.

Ключевым компонентом внедряемой концепции цифрового производства является использование определенного программного обеспечения, которое позволяет всем работникам нефтяного сектора выполнять свою деятельность быстрее и эффективнее, сокращая операционные издержки отрасли.

Ключевые слова: мировой рынок нефти; нефтедобыча; нефтепереработка; цена на нефть; цифровое производство; «Газпром нефть»; «ЛУКОЙЛ»; «Роснефть»; Россия; энергетика; капитализация; информационные технологии; цифровые технологии.

1. Introduction

Oil is one of the most important commodities in the global market. The states actively use this natural resource. One of the factors for the development of the state’s economy is the successful processing of oil and the production of petroleum products from it, the use of oil in various industries, and not only as an export of raw materials. Russia is the only one among the major industrialized countries of the world, which is not only fully provided with oil, but also exports fuel to a considerable extent. Its share in the global balance of fuel and energy resources is large. The relevance of this study lies in the fact that the modern oil market is characterized by instability and high competition. Depletion of oil fields, depreciation of equipment for oil production, price instability and political conflicts have a detrimental effect on the Russia’s position in the global energy market, especially in conditions of the world economic recession and transit to the new technology mode.

2. Purpose

The aim of the paper is to study the place and role of the Russian Federation in the global oil market in conditions of digitalization.

To achieve this goal, it is necessary to solve the following tasks:
• to consider the main trends in the development of the world oil market;
• to study the development of the system of legal regulation of the world oil market;
• to reveal the importance of innovative technologies in changing the place and role of Russia in the oil market.

The subject of the research is the oil market as a special segment of the global economy.

The object of the research is the state of the modern Russian oil market in the context of the economic transformation of the world economy.

3. Brief Literature Review

Recent studies of domestic and foreign authors differ greatly in the role and assessment of Russia in the global oil market. They are distinguished primarily by the level of operating with statistical data, access to the completeness of information and the level of politicization of the research. Some authors provide objective information about Russia’s place in the world oil market comparing the yield of crude oil reserves in Canada, Norway, Russia, Kuwait, Saudi Arabia and the United Arab Emirates (Basher, Haug, & Sadorsky, 2018). The authors argue that oil reserves affect stock returns in Canada, Russia, Kuwait and the United Arab Emirates. Oil supply shocks are important for the UK, Kuwait and the United Arab Emirates. Mexico is the only country where stock returns are not affected by shocks in the oil market.

In the joint research of domestic and foreign researchers (Tuzova & Qayum, 2016), Russian positions in the world oil market in the context of sanctions against Russia are discussed. The results show a significant impact of oil prices on the Russian economy. Researchers predict that Russia’s economic prospects are not very optimistic and real GDP will decline by an average of 19 percent quarterly over the next two years.

A. Vatansever (2017) touches another aspect of Russia’s position in the world oil market, associated with the construction of pipelines. The consequences of Russia’s excess capacity can be significant for Europe and Asia. As for oil, the manoeuvring space is wide enough to allow Russia to abandon the whole route of its choice.

Domestic researchers (Goppert, Ola, & Prakash, 2015) reveal the importance of introducing innovative technologies in the extraction and development of oil fields, without which it will be difficult for Russia to find its niche in the modern oil market.

Parkhomchuk M., Kuzmina, V., & Golovin, A. / Economic Annals-XXI (2019), 180(11-12), 110-121
A. Bondar (2019) in his study notes that US sanctions have become a kind of catalyst for strengthening Russia’s position in the world oil market. But R. Ivanov (2019) argues that not everything is so optimistic for our country and offers three scenarios for the development of the world energy industry until 2050, in which Russia is far from leading positions in the world oil market.

Bryce Daniels and Daniel K. N. Johnson (2019) research the issues of innovations implementation in the US oil and gas sectors. They find «a significant, positive and highly elastic correlation between expected commodity prices and innovation».

The digital production concept in the oil and gas industry and its implementation in one or another way are opened up in the recent studies by many foreign scholars. Christian S. Ritter (2019) reveals peculiarities of the oil and gas industry digitalization around the world and developing business intelligence software for oil and gas corporations on the example of Norway.

Izabela Jonek-Kowalska (2019) studies efficiency of energy and fuel enterprises, including oil producers and distributors, in Central and Eastern Europe analysing and assessing extensively the efficiency of their enterprise risk management (ERM) systems on the basis of digital technologies. She concludes, in particular, that inefficient ERM is a factor of negative or declined Book Value (BV), Economic Value Added (EVA) and Market Value (MV) numbers in times of crisis and prices instability, however, taking into account the specifics of fuel and energy market, the decisive influence of ERM systems implementation on business efficiency cannot be confirmed unambiguously in either short- or long-term perspective.

In contrary to the findings of I. Jonek-Kowalska (2019), Yasin Hajizadeh (2019) from the Microsoft Corporation, USA, in his paper on the digitalization of workflows with the use of machine learning and advanced analytics, in particular, aimed at assessment and reduction of risks in the oil and gas industry, is quite optimistic regarding ERM systems as well as maximum digitalization of management and team work in general.

Thus, the relevance and topicality of the study is quite obvious, as well as the presence of many discursive aspects inside the field of research.

4. Materials and Methods

Articles, publications of domestic economists and political scientists, statistical data, information posted on the websites of the Ministry of Economic Development and the Ministry of Energy of the Russian Federation, reports of the largest oil companies were used in this work.

Analysis and synthesis of scientific literature, documents, statistical data, as well as an illustrative-graphic method were used as the methods of the research.

The source materials for the analytical study were statistical data from the official sources: the Centre for Macroeconomic Analysis and Short-term Forecasting (2019), the Ministry of Economic Development of Russia (2019), Ru-Stat (2019), the Analytical Centre for the Government of the Russian Federation (2018).

Significant statistical and analytical support was provided by using the strategic reports on Gazprom Neft (2017) and LUKOIL oil company (2018).

We applied standard methods of statistical data processing with their subsequent analytical substantiation.

5. Results

The crude oil and oil products market is a very complex and sensitive system, the state of which depends on many factors: political, economic, technological, on the level of oil production, etc. However, this market is fairly well organized, has its own characteristics and rules of the game.

Today, the subjects of the oil market are international oil companies, national oil companies, as well as small local companies. Traditionally, there are a number of oil companies that set the tone in the global oil market. The Tyumen portal presents 10 leading oil companies of the world and their level of market capitalization at the beginning of 2018 (Portal Tyumen, 2018). We will present a similar top ten oil companies, but with data on their market capitalization as of the beginning of 2019 (Oil-Gas-Fossils website, 2019), as well as information for the beginning of 2020 provided by the Calculator: Help Portal (2020) (Table 1 and Figure 1).

Oil is produced in different regions of the world. The largest states in terms of «black gold» deposits are: Venezuela, Saudi Arabia, Canada, Iran, Iraq and Kuwait (Table 2).

To ensure security in the global oil market, there are a number of documents and regulations that govern various aspects of relations in this sector.
One of the well-known energy regulatory instruments is the Energy Charter of 1991 which is a political declaration that expresses the principles of international cooperation in the energy sector on the basis of a common interest in reliable energy supply and sustainable economic development.

Participation in the Energy Charter process is not limited to the signing of the Energy Charter Treaty. The Energy Charter is not only a legal basis, but also a multilateral political forum in which governments of different states take part in a dialogue on cooperation in the energy sector.

International treaties are the most important sources of energy law. One of the intergovernmental agreements in the energy sector is the Vienna Convention on the International Sale of Goods, since a large amount of energy equipment, which is necessary for the construction and operation of energy facilities, is purchased in different countries.

### Table 1:
The dynamics of market capitalization of the world oil companies, USD billion

| Company                  | At the beginning of 2018 | At the beginning of 2019 | At the beginning of 2020 |
|--------------------------|--------------------------|--------------------------|--------------------------|
| Exxon Mobile (USA)       | 377                      | 318.77                   | 149.99                   |
| PetroChina (China)       | 213.13                   | 165.24                   | 123.46                   |
| Chevron (USA)            | 221.04                   | 236.63                   | 125.068                  |
| Total (France)           | 134.6                    | 142.59                   | 83.52                    |
| Royal Dutch Shell (the Netherlands) | 252.12                | 257.72                   | 118.85                   |
| BP (UK)                  | 126.83                   | 133.03                   | 73.54                    |
| Gazprom (Russia)         | 59.932                   | 88.79                    | 49.97                    |

Source: Compiled by the authors using data as follows: 2018 - Portal Tyumen; 2019 - Oil-Gas-Fossils website; 2020 - Calculator: Help Portal

### Table 2:
Countries leaders in oil production

| Nº | Country       | 2019, barrel/day | %  | 2017, oil production per capita (barrel/day/million people) |
|----|---------------|------------------|----|------------------------------------------------------------|
| -  | WORLD         | 80 622 000       | 100| 10 798                                                     |
| 1  | USA           | 15 043 000       | 18.7| 35 922                                                     |
| 2  | Saudi Arabia (OPEC) | 12 000 000     | 14.9| 324 866                                                    |
| 3  | Russia        | 10 800 000       | 13.4| 73 292                                                     |
| 4  | Iraq (OPEC)   | 4 451 516        | 5.5 | 119 664                                                    |
| 5  | Iran (OPEC)   | 3 990 956        | 5.0 | 49 714                                                     |
| 6  | China         | 3 980 650        | 4.9 | 2 836                                                      |
| 7  | Canada        | 3 662 694        | 4.5 | 100 931                                                    |
| 8  | UAE           | 3 106 077        | 3.9 | 335 103                                                    |

Source: March 2019 data regarding barrels per day: according to the EIA (Energy Information Administration, Department of Energy Information of the United States of America which is an independent agency within the US federal statistical system responsible for collecting, analyzing and disseminating energy information); 2017 data regarding oil production per capita (barrels per day per million people), source of population data: the United Nations Department of Economic and Social Affairs (2017)
Various ongoing discussions regarding regulation of oil and gas production in different states are always topical. For example, peculiarities of oil and gas sector development regulations and restrictions in different countries are studied and discussed by the American specialists Jonathan M. Fisk, A. J. Good and Steven Nelson (2017).

Another interesting legal issue of high sensitivity is connected with the regulations and information disclosure in the sector of unconventional oil and gas production. As state Jonathan M. Fisk and A. J. Good (2019), even at the national level, the policies regarding disclosures in different American states vary. The authors consider three legally noteworthy types of information disclosure, namely: pre-drilling notification, chemical disclosure during operations, and trade secret exemptions.

There is a wide range of different documents in the field of oil and gas regulation in the Russian Federation. They are the following: Federal Law «On Subsoil», «On energy saving and energy efficiency improvements and on Amendments to Certain Legislative Acts of the Russian Federation», «On the safety of fuel and energy facilities», «On the state information system of the fuel and energy complex», the order of the Government of the Russian Federation «On the approval of the Energy Russian strategy until 2030».

Every year, the Russian Federation extracts about 550 million tons of oil and immediately almost half of the extracted oil is refined. Russia confidently ranks second in the world in oil exports, behind the first place in Saudi Arabia. U.S. sanctions against countries like Iran and Venezuela helped Russia boost physical oil exports in 2019. Between January and November 2019, crude oil deliveries abroad increased by 3.8% in physical terms compared to the same period in 2018, according to statistics from the Federal Customs Service (Table 3). In 2018, the fuel and energy complex showed stable dynamics not only in production, but also in export. Oil export in 2018 amounted to 260.2 million tons, which was an increase of 2.9% or 7.4 million tons compared to 2017 (Federal Custom Service of Russia, 2020).

The main buyers of energy from Russia are such countries as the Netherlands, China, Germany, South Korea, Poland, Japan, Italy, Belarus, Turkey, and Finland. According to the Ministry of Economic Development of the Russian Federation, the physical export of oil to Turkey for 11 months of 2019 increased by 4.5 times compared to the same period in 2018 due to the «reorientation of a number of Turkish oil refineries to Russian raw materials after the resumption of US sanctions against Iran» (Forbes Russia, 2020).

The main directions of oil supplies were China (69.6 million tons, + 2.7 million tons by 2018), the Netherlands (46.2 million tons, +4.4 million tons), Germany (18.9 million tons, -4.6 million tons), Belarus (18 million tons, -0.2 million tons). Due to oil pollution in the Druzhba pipeline, direct deliveries to Belarus and Germany decreased. Republic of Korea (15.3 million tons, unchanged, 1/3 actually goes to other Asia-Pacific countries), Italy (14.6 million tons, +1.5 million tons, more than half actually goes to other countries), Poland (13.3 million tons, -4.4 million tons), Finland (9.9 million tons, -0.3 million tons) and Turkey (8.2 million tons, +6 million tons) (Analytical Center under the Government of the Russian Federation, 2019).

In 2019, the export of petroleum products (all) was nominally directed primarily to the Netherlands (29.5 million tons, +1.6 million tons by 2018), the USA (12.1 million tons, +3.9 million tons), Malta (9.3 million tons, -1.8 million tons), Turkey (8 million tons, -2 million tons), China (7.9 million tons, +0.9 million tons), Germany (5.7 million tons, -0.6 million tons), Latvia (5.6 million tons, +1 million tons), the Republic of Korea (5.2 million tons, -0.4 million tons), Singapore (5.1 million tons), -0.1 million tons) and Denmark (4.8 million tons, -0.5 million tons). In fact, the United States (more than 20 million tons), the other leading ones - Singapore, Germany (10-12 million tons each), Turkey, the Netherlands, China, the Republic of Korea, Belgium, France, and Great Britain (5-8 each) have been the main importer of Russian oil products for many years. million tons) (Analytical Centre under the Government of the Russian Federation, 2019).

Table 3: Russian exports for January-November 2019

| Code | Name             | January-November 2019 | Growth rate of January-November 2019 to January-November 2018, % | November 2019 | Growth rate of November 2019 to October 2019, % |
|------|------------------|-----------------------|---------------------------------------------------------------|---------------|-----------------------------------------------|
|      |                  | thousand tons USD mln | weight cost                                                   | thousand tons USD mln | weight cost |
| 2709 | RAW OIL          | 245 842.3 111589.1    | 103.8 94.2                                                   | 22 32.2 9 681.8 | 91.0 90.3                                      |
| 2710 | OIL PRODUCTS     | 128 914.0 60 731.6    | 93.0 84.1                                                   | 12 43.7 5 407.2 | 106.3 100.2                                   |

Source: Compiled by the authors based on data by the Federal Custom Service of Russia (2020)
Oil and gas companies need to understand how new information technologies can be applied in order to gain competitive advantages», said Richard Holsman who was a Managing Director on Global Energy Digital & Technology at Accenture Microsoft Business Group (Gazprom Neft, 2014). Giants such as Shell or ExxonMobil are already using digital technology to control the development of projects using mobile devices. For the exploration and production segment, this means that all the information about the development of the field is processed and, with the help of special applications, is displayed on the mobile devices of interested persons in real time. The project operator can see on his tablet how drilling or production is going, and the top manager can see business analytics. Mobility in this case provides round-the-clock control and quick decision-making.

At the present stage of development, in Russia digital technologies are actively developing. Given the specialization of the Russian Federation in the primary industries and the dependence of the state on oil production and exports, the introduction of digital technologies in domestic oil companies has already started making a significant contribution to the development of the country’s economy. The main oil producing companies in Russia are: Gazprom Neft, Rosneft, Lukoil, Surgutneftegaz. Let us consider what digital technologies are used at these companies.

Rosneft is the largest oil and gas company in the Russian Federation and the largest in the world in reserves and production of liquid hydrocarbons among other public oil and gas companies. This company has shown a steady increase in the volume of economically viable hydrocarbon reserves. In 2017, Rosneft PJSC presented the Rosneft-2022 strategy, in which digitalization was called the most important element of further business development. Thus, in the field of exploration and production, the task of technological breakthrough is posed, which can be solved by optimizing digital models for developing key mining projects using productivity-enhancing technologies, 3D/4D geological and physico-chemical modelling. To achieve the goals of the Rosneft-2022 strategy, the company has already signed an agreement with General Electric on the creation of a joint venture focused on the introduction of modern digital technologies and new industrial Internet standards. The introduction of the latest digital solutions will optimize the system for collecting, processing and analyzing industrial data (Rosneft, 2017).

Gazprom Neft is the second largest company in Russia and a leader in Russia in the implementation of information technologies and automation of oil refining processes. At the refineries of the company, virtual quality analyzers are actively used - mathematical models that make it possible to predict quality indicators without actually measuring them, on the basis of previously performed laboratory tests.

The relevant areas in this field are the creation of models and the performance of experimental studies of processes occurring in the natural environment, the development of software for processing and interpreting geological and geophysical data, and so on. These developments will assist in obtaining virtual images of production facilities that will speed up the process of creating new types of equipment, design and construction. Gazprom Neft is introducing digital technologies to improve the efficiency of exploration and production since the foundation of its company. In 2012, it was decided to proceed to the implementation of a strategy on the development of digital products named «Electronic development of assets» («ERA») which was designed to ensure the operational management of key production stages (monitoring of well operation, analysis and control of production, selection of the optimal field development system). «ERA» was an important step towards the effective use of digital technologies in mining, which allowed the company to achieve improved process efficiency. «ERA» has already included 40 projects in 2018. It is among main instruments of complex and widespread digitalization of business at all levels of estimating field costs, production and management in Gazprom Neft, including AI, mobile technologies and robotization (Gazprom Neft, 2018).

In the oil industry, the trend digitalization has influenced all areas - from production to sales. A modern field, and even more so a field of the future, is unthinkable without constant monitoring of the state of wells and downhole equipment, pipelines and surface infrastructure. The obtained data allows you to track production indicators in real time, respond to process changes in a timely manner, and prevent breakdowns and accidents, save energy and other resources. Further processing and analysis of information makes it suitable for use in planning and making high-quality managerial and strategic decisions. The result of the introduction of «smart» automation in the fields - optimization of drilling and increased oil recovery, savings in operating costs up to 25%. As for further development, an increase in the number of sensors, an improvement in their technical characteristics, and an increase in operating efficiency are certainly important, but the
main task is still in a more intellectual plane. All of these multi-byte datasets must be turned into a full-fledged asset that brings profit to the company. Only in this case the cost of automation is fully justified. Ideally, a fully automated refinery is a plant where information from any sensors and any processes is accumulated, systematized, analyzed and forms the basis of models that allow you to make strategic decisions at the highest level. That is, thanks to information technology, the value of data must multiply, and they themselves must become a commercial resource. To realize this vision, in addition to «ERA», Gazprom Neft has introduced an integrated system of the conceptual development of assets «ERA-ISKRA» (Gazprom Neft, 2014, 2018). It is the next stage of development of a comprehensive concept of «digital» production.

Thus, the concept of «digital field» appeared - the field of the future, the most effective and safe. Work on this concept began in 2013 and Gazprom Neft-Khantos was chosen as the platform for applying this new technology, since this division of the company is one of the most modern and advanced from the technological point of view.

In general, the concept of «Digital Field» in the company combines several basic «digital» approaches: the use of updated geological and engineering models, operational production management, integration with financial and economic indicators, the accumulation of knowledge and experience and the creation of a single database and, of course, teamwork and joint decision making (Kobzy & Titova, 2019).

The implementation of such projects is a multi-stage and painstaking task. It is necessary to assess the existing situation, highlight the processes where the «digital» approaches will give the greatest effect, prioritize and understand the necessary conversion depth for each of them, and finally create a roadmap. Some of the technologies that in the future will undoubtedly enter the Digital Field have already been introduced or are being developed at Gazprom Neft. For example, the key to successful development of complex geological objects is the constant updating and refinement of the reservoir model. This work is already underway in the company: an in-house development, the GeoMate system, is being introduced to accumulate and analyze geological and field data. Within each Digital Field program, the task of integrating data from different sources is solved. Technically, for this purpose different approaches and tools are used. As part of the overall IT strategy, Gazprom Neft provides the platform for the creation of a special platform for collecting, merging and storing data from different disciplines about the same fields and wells (in terms of geology, drilling, and economics).

At the present stage of development, all Gazprom Neft refineries are equipped with digital distributed control systems («RSU»). Also, to improve the efficiency of work, Advanced Management Systems («APC») have been developed and implemented. The introduction of such systems is one of the current areas of development at the company’s refineries, as they represent a kind of autopilot, which takes on the function of making decisions in case of departure from the regulatory regime.

New technologies and communication capabilities, among other things, change the appearance of the average production employee, regardless whether it is a drilling or oil refinery. Linking industrial and information technologies together leads to the fact that human participation in production processes is reduced to remote observation and timely adjustment of parameters. In turn, the development of mobile applications allows us to talk about future changes in the very principle of decision-making: the main role will be played by the opinion of not one specialized specialist, but the multi-competent expert community.

Such system solutions are already being introduced by world giants of the oil industry. Russian companies do not yet have full-fledged platforms for joint cooperation, but the tendency for their emergence is already visible. For example, Gazprom Neft has created a Competence Centre, which brings together geologists, developers, seismic scientists from the Scientific and Technical Centre, the corporate centre and its subsidiaries. Due to his work, today it is possible to find solutions for difficult cases in the process of drilling new wells and developing new reserves (Kobzy & Titova, 2019).

The employees of the centre work on the GeoMate information system platform, developed with the participation of experts from Gazprom Neft NTC and IT specialists of the company. However, today Gazprom Neft is only at the beginning of the journey to master all the possibilities of modern information technologies.

In 2017, Gazprom Neft strengthened its leading position in the Russian oil industry, increased production and financial performance, net profit. That success was mostly determined by the development of deposits in the Arctic zone. At the company’s refineries, construction of new production facilities continued as part of the second stage of a large-scale asset modernization program.
The LUKOIL Group has developed the world’s first actuators based on valve electric motors, which have a combination of characteristics that allow for the implementation of an optimal technological mode for selecting well production with minimum energy consumption and maximum resource. Valve electric motors reduce energy consumption during oil production due to higher efficiency values and lower operating currents, as well as due to the possibility of controlling rotational speed and cyclical operation. In the future, it is planned to replace the entire stock of wells equipped with asynchronous engines with valve ones (Aldieri, Kotsemir, & Vinci, 2019).

The scientific research institute of the LUKOIL group has developed a technology that does not have any analogues in the world to process waste generated at refineries in the process of producing a high-octane gasoline component. This technology makes it possible to obtain calcium fluoride from these wastes, which can be used in the metallurgical industry as a full-fledged substitute for imports of fluoride spar, a natural analogue of calcium fluoride, in demand on the market.

The concept of an intellectual field (LIFE-Field), implemented in the company LUKOIL, is to integrate the field management processes based on automated computer systems and high-tech data collection systems. The concept covers the full production cycle of the project, from the search and exploration stage to the completion of development, and includes such units as integrated modelling, integrated planning, an integrated operations centre, etc. The main source for such optimizations is identification of bottlenecks followed by effective elimination. For example, a significant effect is provided by an increase in the coordination of geological modelling and modelling of the field infrastructure development.

The most complete intellectual field technology has been implemented on the Company’s largest foreign projects in Uzbekistan and Iraq. In Russia, the Company actively applies such technologies in the Caspian Sea and in the Urals, while conducting work on their implementation in other regions of operations (LUKOIL, 2019).

Today, there are a number of factors that impede the effective development of Russia in the energy sector.

The first factor is the situation with coronavirus that has led to a slowdown in the global economy, which, in turn, has reduced demand in commodity markets. «Of course, first of all, the demand for oil has decreased, which has further reduced prices», says Alexey Buyanov, CEO of the investment company Bengala Investment (cit. by Chablin, 2020). Initially, it is important to understand that oil is the most complex type of raw material for analysis than other resources. Based on this, rising/falling oil prices can have both positive and negative consequences for the development in the short and long term.

The second factor is the OPEC + deal, which could stabilize the situation, but in the end there was a rupture of agreements, which hit the market even more seriously. Russia suffers losses due to the price war. However, Russia has larger international reserves and a floating rate of the national currency. Thus, according to the Financial Times, the Russian economy as a whole is less dependent on oil than the economy of Saudi Arabia (Pyatin, 2020).

The third factor is the non-stimulating fiscal policy of Russia, namely, the tax on traditional minerals, the tax on the reproduction of the mineral resource base and a number of other taxes.

The fourth factor holding back development is the dependence of Russian exports on foreign markets, especially the European and Asian ones. Strengthening environmental restrictions on exports, as well as European Union’s policies to diversify energy sources, which has already lead to the reduction in oil exports.

Another important issue is the utilization of petroleum gas. In large oil fields, which are located quite far from industrial centres, oil gas is often burned. It is necessary to create installations or small installations for its use applying the developments of scientists.

The sixth factor is the high degree of wear of equipment for oil production. Corrosion is one of the significant factors that causes damage to oil production equipment and reduces the residual life of its operation. In most cases, corrosion during the extraction and transportation of oil occurs due to the presence of three main substances - hydrogen sulphide, carbon dioxide and water.

Russia occupies a high niche in the world in oil production and refining. The state pays great attention to energy. To support the oil industry, the government approved the Energy Strategy of Russia for the period until 2035. This program has developed a specific target scenario, according to which it is planned to use all the advantages of the oil and other energy sectors by 2035 as efficiently as possible. This can be achieved using the following measures:

• increase in value added for petroleum products;
• the progressive development of the oil industry in the Far East and Siberia;
• increase the innovative component of oil production and refining in order to reduce costs;
• stimulating the development of additional investments in the oil industry of the Russian Federation due to the great influence of the industry on the country’s economy (Wu & Chen, 2019).

An increase in production and in its efficiency are impossible without intensifying the use of scientific and technological progress in the industry, improving drilling methods, stimulating the reservoir, increasing the extraction of reserves and introducing other advanced technologies for oil production, which will make it economically viable to use solid oil reserves.

In order to bring the production of petroleum products closer to its consumers, it is necessary to build new highly efficient refineries in areas of concentrated consumption of petroleum products, and in the remote northern and eastern regions to develop certified small refineries with a full oil refining cycle.

6. Discussion

Today, for 2020, the situation in the world in the oil market has changed. The American rating agency S&P Global also believes that the situation with the spread of coronavirus caused a disruption in the economy of many countries and it will lead to a global recession. S&P experts predict the global recession in 2020 with an overall GDP growth of only 1% (Interfax, 2020). IMF (2020) estimated reduction of the world GDP for 1% as for 2019. Earlier, US President Donald Trump admitted that the US economy is moving toward recession. The market reacted to the statement of the American leader by a record collapse.

For example, China is committed to efficient, self-sufficient, environmentally friendly and innovative energy production and consumption. Typically, China relies on foreign exports for almost 60% of its oil, with Saudi Arabia, Angola and Russia being the largest oil suppliers. Coronavirus in early 2020 dealt a tangible blow to the entire economy of China. S&P Global Ratings chief economist Paul Grunwald today refutes the view that it is impossible to restore the Chinese economy in the near future, believing that «initial data from China suggest that the Chinese economy suffered a more serious blow than previously assumed, although there are already preliminary stabilization signals» (Interfax, 2020). China will continue to follow the energy strategy introduced in 2018 as its economic potential recovers. This is a document on the development of the energy sector in China until 2050. A published paper shows that by 2050, China could build a low-carbon economy with extremely low emissions from renewable energy sources.

According to analysts at Oxford Economics, a recession will begin in the US and Eurozone economies. They call the disease «a brief but very acute shock.» The economies of Germany and Italy are already balancing on the brink of recession (Tairov, 2020). In the German Energy Concept until 2050, it all comes down to the fact that the state is moving into the era of renewable energy sources. Currently, more than half of the total volume in the structure of all areas of the German energy sector is made up of oil products (34.6%) and gas (21.7%). As for oil, from its own proved reserves Germany can cover only 4% of the volume necessary for the normal functioning of the country’s economy (Kobzy & Titova, 2019).

Nowadays the task of making Germany the first country in the world which will completely have switched to energy derived from environmentally friendly sources by 2050 is on the agenda of the German government in the energy sector. From a technical and economic point of view, according to experts of the Federal Agency for Environmental Protection, this plan will be implemented even on the basis of existing technologies.

As for the energy sector, it is possible to achieve high-impact, energy-efficient, resource-saving and geo-ecological production with the help of innovative technologies. They contribute to the search for new oil and gas fields, an increase in the coefficient of extraction of reserves and the depth of processing of raw materials, reducing losses during production and transportation.

There are five groups of innovation development:

• oil and gas innovations in the field of prospecting and exploration of deposits;
• innovative technologies of production and increase of oil and gas;
• innovative technologies in the field of oil refining;
• oil and gas infrastructure of a new generation;
• use of IT-innovations in the production processes of oil and gas companies.

To date, there are almost no undeveloped easily accessible deposits. Geologists are trying to find ways of oil production in harsh natural conditions, remote areas with a complex structure of
rocks. The main method used in the study of the subsoil is seismic. When used, an artificial source excites elastic waves. The seismic receivers record information, and then the data is processed and interpreted. Oil and gas innovations such as electrical exploration and high-density seismic UniQ helped to increase the number of sources and receivers of waves and increase the accuracy of research. Another innovation in the field of search is the beam modelling technique, which calculates the optimal layout of the excitation sources and recording equipment. With the help of 4D seismic, oil and gas basins having a complex structure are modelled, changes in deposits are assessed, the accuracy of predicting oil and gas potential is increased, the effectiveness of prospecting, detection and technical preparation for further development of the field is increased, and the efficiency of the resource base is increased. The introduction of innovations contributes to the growth of recoverable reserves and reduces investment in production drilling.

7. Conclusions

Today we can single out the main foreign economic interests of Russia for the development of the state's economy:

- creating an integrated support system for competitive domestic products in foreign markets;
- developing economic, political and trade relations within the framework of the Eurasian Economic Union and the formation of joint competitive advantages in the global division of labour;
- forming and developing the system of import substitution, active promotion of competitive Russian import-substituting industries, especially export-oriented ones;
- building stable diversified ties with world economic centres that increase the long-term sustainability of the development of the Russian economy;
- strengthening trade and economic relations with China, India, Brazil, Mexico, South Africa, Egypt, Saudi Arabia, South Korea, Turkey, ASEAN countries and other states of the Asia-Pacific region, the Middle East, Africa and Latin America;
- achieving leading positions in the implementation of energy supplies to world markets based on geographic and product diversification of exports, participation in the formation of the global energy infrastructure and the development of rules for the functioning of global energy markets.

One of the priorities of Russia’s foreign economic policy is to increase Russia's role in ensuring global energy security and strengthening its position in the hydrocarbon market.

Changing of geographical structure of the world oil market contributed to a reversal of the main energy consumption towards the Asia-Pacific region (CMASF, 2013).

Oil is the national wealth of the Russian Federation, the source of the country’s high status in the global energy market and the foundation of its economy.

The Institute of Energy Strategy (Russia) presented three main scenarios for the development of world energy:

- inertial catastrophic;
- stabilization-stagnation;
- innovative and revolutionary (cit. by Ivanov, 2019).

Each of these scenarios has its own path and scale of energy demand. All three projections involve two stages: until 2030, and the period from 2030 till 2050. At the first stage, the forecasts roughly converge: the world energy sector will retain the current state with a few exceptions. Since Russia depends on the sale of oil and other energy resources, by 2050 the prospect will not have been the best. We can expect a strong crisis in the economy, since most of the income to the Russian budget comes from the export of oil and gas. Though many countries are in the course of leaving energy dependence by 2050, which is possible.

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Received 19.10.2019
Accepted 27.11.2019
Available online 30.12.2019
Updated version of the paper 20.03.2020