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**DEVELOPMENT OF OIL-GAS RESEARCH AND EDUCATION
INSTITUTES IN GROZNY IN 1920-1980**

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Abstract

This paper covers the history of the origin and the development of petroleum science and the establishment of research institutes in Grozny since the late 1920s of the 20th century. The activity of the large research and educational institutes is revealed - GrozORI, SevKavNIPIneft, GOI, etc., listing the main research domains and research outcomes. Oil and gas will play a leading role in the regional fuel and energy balance. In this regard, it is necessary to strengthen the research and geological exploration in the region. Several stages of development of the research in the field of extraction and processing of hydrocarbon raw materials are identified. The work is carried out on the basis of available archival and published sources on the history of establishment of oil and gas research institutes in the Chechen Republic. The main results of research in the field of oil and gas geology, geophysics and geochemistry are covered in the collections of papers of the GOI published every two years. In conclusion, the authors note that the establishment of the oil and gas research center in Grozny is due to the intensive development of oil industry in the period from the 1930s to 1980s of the last century in the Grozny district.

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1. Introduction

Chechen oil production and refining have evolved for a long time. This sector has been developed step-by-step encountering difficult situations. The way out is to organize research and educational work which will focus on the solution of the problems arisen in oil production and processing. Thorough studies of the research and exploration in the Chechen Republic began only at the beginning of the 20th century. The research laboratory was established as part of Grozneft association to solve mainly practical issues of oil production. Then the first research institute for oil industry in Grozny - Grozny Oil Research Institute (GrozORI) – was established, and the following departments were opened: technological, production, physical and mechanical tests and materials research, researching in gasoline and kerosene, cracking, oil, analytical and other sectors. The staff of the geological department of the Institute conducted the studies of great theoretical and practical importance. The research results of the scientists were published in collections of works of GrozORI and SevKavNIPIneft.

2. Problem Statement

In the history of development of oil production and refining in the territory of the Chechen Republic, there are several stages, differing in volumes of oil produced and refined, methods of extracting oil from the subsurface, methods of prospecting, exploration of hydrocarbon, etc. At the end of each stage difficult situations arose, which were dealt with in a cardinal manner.

3. Research Questions

There are several stages that can be identified in relation to the establishment and development of research and educational institutions, as well as research in the field of oil production and its processing:

1. Establishment of oil research and educational institutions in Grozny.
2. The research and technological developments in the field of oil and gas production and oil refining during the Great Patriotic War of 1941-1945.
3. Further development of educational institutions and research in the field of oil and gas in 1950-1980.

Study of all these stages are necessary to map out the strategy for further development of Russian oil industry and economy of the Chechen Republic.

4. Purpose of the Study

For a long time, the extraction and processing of oil was carried out haphazardly, in the absence of scientific foundations of geological exploration process, and only in the late 1920s a full-fledged system of oil and gas production began to appear, the components of which were the research and exploration. In the short term, it is oil and gas that will play a leading role in the regional fuel and energy balance. In this regard, it is necessary to strengthen the research and geological exploration in the region.

5. Research Methods

The methodological basis for the implementation of this work was the historical and scientific, as well as system and analytical approaches to research. The work was carried out on the basis of available archival and published sources on the history of establishment of oil and gas research institutes in the Chechen Republic.

6. Findings

As stated before, there are several stages that can be identified.

6.1. Establishment of oil research and educational institutions in Grozny.

A new stage in the development of oil-producing and oil-refining industries of the Chechen Republic began in the 1920s, the stable operation of which required strengthening of research and exploration. In 1920, the research laboratory was established as part of Grozneft association to solve mainly practical issues of oil production. The laboratory staff under the supervision of I.O. Luchinsky conducted research on chemical analysis of water used in drilling, was engaged in the development of water isolation methods, the selection of optimal formulations of cement grouping, etc. (Daykaev, 2013). This laboratory was the basis for establishing the first research institute for oil industry in Grozny - Grozny Oil Research Institute (GrozORI). The following departments were opened at the Institute: technological, production, physical and mechanical tests and materials research. The technological department included gasoline and kerosene, cracking, oil, analytical and other sectors. The production department included geological, drilling and well operation sections. GrozORI was created by the order of the State Association of Grozny Oil and Gas Industry Grozneft dated 15 September 1928. The date of its opening was 1 October 1928. The Institute was administered by: the USSR Supreme Economic Council (1928-1932); People's Commissariat of Heavy Industry of the USSR (1932-1939); People's Commissariat of Fuel Industry of the USSR (1939); People's Commissariat - the Ministry of Petroleum Industry of the USSR (1939-1946). The winners of the USSR State Prize B.K. Americas Z.G. Orkina, K.G. Lavrentiev were the staff of this Institute.

At the beginning, the main research areas of the Institute were the following: development of technologies for producing various oil grades, production of catalysts for catalytic cracking, rectification of deep oil refining, improvement of technologies for selective purification of oils using paired solvents, synthesis and application of zeolites, etc. The Institute was involved in studying physical and chemical properties of petroleum products, developed zeolites, conducted research in the field of petroleum geology, oil exploration, drilling, on the secondary methods of reservoir development, on gas lift and other methods of oil production and oil exploration (Organisational documents, 1965-1976; Research documents of the institute (1923-1981)).

In the early 1930s a laboratory of flushing liquids headed by Professor V.S. Baranov was established on the basis of the Institute. The laboratory staff conducted major studies on the properties of clay mud, developed methods for its chemical treatment in order to prevent complications during well drilling.

At the same time, the first scientific classification of petroleum was developed, taking into account the group chemical composition of petroleum fractions, which made it possible to select the most efficient ways of refining petroleum, predetermine the range of petroleum products, etc.

Basing on the studies of the main laws and chemistry of cracking (thermal decomposition of oils under high temperatures), Grozny scientists were the first to propose and substantiate the types of cracking — light cracking, deep cracking, and cracking to coke. The book *Cracking in the liquid phase* edited by professors A. N. Sakhanova and M. D. Tilicheeva have always been very popular. One of the important achievements in the field of petrochemistry and oil refining was the production of synthetic zeolites. As a result of studying the patterns and mechanism of crystallization of zeolites, Grozny scientists obtained zeolites without binders in the form of granules (ball zeolites are better adsorbents).

In 1920, in Grozny, by the decision of People's Commissariat of Education of the RSFSR Grozny Higher Petroleum Technical College was established. Leonid Vladimirovich Kurskoi was appointed the first director of the technical school. In 1922, the technical school was renamed the Petroleum Practical Institute, and in 1929 - Grozny Oil Institute (GOI). It was the first technical college in the national regions of North Caucasus, with the discovery of which the university science began to emerge. At the same time the Institute scientists began to conduct the research in the field of oil and gas geology, drilling and development of hydrocarbon fields, processing and transportation of oil and oil products (Jafarov, 1993; Isaeva, 2017). Later on there were opened the research schools at the Institute: geologists, geophysicists, drillers, developers who were professors P. P. Zabarinsky, B. K. Lotieva, G. M. Sukhareva, S. S. Itenberg, A. I. Guzhova, and others, who made an invaluable contribution to the development of industry and university science in the Chechen Republic.

6.2. The research and technological developments in the field of oil and gas production and oil refining during the Great Patriotic War of 1941-1945.

One of the most difficult periods in the development of industry and university science in the Chechen Republic was the period of the Great Patriotic War. The Hitler plan of Barbarossa envisaged the seizure in the shortest possible time of the oil regions of the Caucasus (Baku and Grozny). Since the beginning of the War, almost all fields of society, including the research and educational ones, were involved into powerful restructuring process, representing a system of various interrelated activities aimed at organizing a military-industrial complex capable of meeting the growing needs of the armed forces (Ibragimov & Khatuyev, 2015; Selyunin, & Selyunin, 2010).

The Great Patriotic War made significant adjustments in the life of research institutes and universities. The characteristic features of the activities of universities during the war were to combine the educational process with the development of research in relation to military conditions. In July 1941, an order was issued obliging the heads of HEIs to review the research subjects in favor of defense. During that period, the scientists from GOI and GrozORI performed a great deal of work to increase oil and gas production and to obtain high-grade gasoline required for aviation (Selyunin, & Selyunin, 2010). The Department of Oilfield Operations headed by K.G. Orkina performed a significant amount of research work on the study of composition of oil sandstones. GOI scientists took part in organizing and conducting the repair of tanks, armored trains and other military equipment at the Red Hammer plant. The work of

Professor F.S. Seleznev, associate professors V.I. Khmelyavsky and S.Ya. Popov, who investigated the problems of ensuring the stability of internal combustion engines in a rarefied atmosphere, protecting armored vehicles and other military metal objects from the damaging effects of thermite mixture. An assistant professor K. Ovanesov developed reinforced concrete bomb shelters and barracks (Jafarov & Jafarov, 2003; Koblev, 2010).

In those conditions it was necessary to produce high-octane aviation gasoline. This task was entrusted to the researchers and specialists of GrozORI. The researchers of GrozORI under the supervision of S.K. Amerika new brands of aviation gasoline were developed. Together with the engineers of Grozny Oil Refinery, GrozORI scientists solved a difficult task of extracting high-quality petroleum products from low-grade hydrocarbon materials. The researchers of the Institute conducted the research on the laws of alkylation of isobutane with olefins and developed a technology for the catalytic process of sulfuric acid alkylation (Odintsov, 1981). Using the results of these studies in 1942, the first domestic sulfuric acid alkylation unit was commissioned at Grozny Oil Refinery, which was a valuable contribution to solving the most important task of providing military aviation with high-octane fuel.

In the field of oil production, the researchers and engineers of GrozORI developed a new technological mode of well operation, which made it possible to significantly increase the flow rate of wells drilled in sub-thrust formations (Kindarova, 2010). There were shopfloors opened at the Institute where they manufactured the ammunition, various incendiary lubricants, etc. So, according to A. B. Odintsov, the following military units were sent from GrozORI: a special “lubricant providing the impermeability of soldiers’ shoes, brackets for engineering structures, fuses for hand grenades, anti-tank land mines and incendiary bottles” (Odintsov, 1981).

6.3. Further development of educational institutions and research in the field of oil and gas in 1950-1980.

In the beginning of the 1950s the organizational changes in GrozORI took place. By the decree of the USSR Ministry of Petroleum Industry of 23 May 1952, the institute was divided into Grozny Oil Research Institute for Oil Refining (GrozORIOR) and Grozny Oil Research Institute for Oil Production (GrozORIOP), which on 15 November 1954 was reunited by decree of the Ministry (GrozORI). The Institute was under the jurisdiction of the People’s Commissariat – the USSR Ministry of Petroleum Industry (1948-1952, 1954-1957); People’s Commissariat – the Ministry of Petroleum Industry of southern and western regions of the USSR (1946-1948); Checheno-Ingush - North Caucasian Economic Councils (1957-1963); State Committee of Petroleum and Chemical Industry under the State Planning Committee of the USSR (1963-1964); State Committee for Oil Refining and Petrochemical Industry under the State Planning Committee of the USSR (1964-1965); Ministry of Oil Refining and Petrochemical Industry of the USSR (1965-1995). There was also Nizhne-Volzhsky branch of the institute. By the decree of the Presidium of Supreme Soviet of the USSR of 21 September 1978, the institute was awarded the Order of the Red Banner of Labor.

Since late 1940s the experts and researchers of GrozORI conducted an important research in the field of artificial effects on productive strata in order to increase their oil recovery. Thus, for the first time

in 1944, the gas injection was carried out in the XVI century into the formation of an overthrust wing and near-water flooding in the Bori-Su area.

In the field of drilling equipment, the researchers of the Institute created original designs of single-cone bits, the penetration of which was three times higher than that of serial three-cone and core bits, providing 100% core removal.

Since its establishment, the Institute had a laboratory of regional geology under the supervision of Professor A.A. Khutsiev began studies on the geological structure and petroleum potential of the Eastern Ciscaucasia and Terek-Kuma lowland. The geologists of the institute compiled structural maps of different scales, introduced some issues of a deep structure of the territory. This division of the Institute in 1953-1956 under the supervision of A. A. Khutsiev conducted a research on the topic The basic laws of tectonic structure of Grozny region and possible tectonic relationships that favor the formation of oil deposits (Daykaev, 2013). As a result of research on this topic, it was established that the study area had favorable conditions for the formation of deposits of oil and gas of structural, lithological and stratigraphic types in the Mesozoic sediments. G. A. Ershov, P. M. Tonkonogov and A.P. Yermolenko note the following is about the period of geological studies conducted by the Institute: “The prospects for further development of oil industry in the North Caucasus are determined by the results of Jurassic exploration over the entire area and lower Cretaceous sediments in the eastern part. Taking this into account, the geologists of the Institute performed laborious work on the compilation of multi-scale structural maps, which allowed to clarify the spatial location of local structures, to clarify some issues of deep tectonics, to establish the relationship of sediments of individual longlines and to conduct tectonic zoning” (Ershov, Tonkonogov, & Ermolenko, 1971).

The employees of the laboratory of hydrogeology and geochemistry which was headed by A.M. Nikanorov (now a corresponding member of the Russian Academy of Sciences) conducted a research on the study of iodine and bromine resources in the groundwaters of Chechnya and Ingushetia. They carried out the zoning of this area on the content of trace elements in waters, recommended specific ways of using groundwater hydrocarbon deposits in the national economy. The research in the field of economics carried out by the laboratory of economics in the oil industry under the supervision of Professor M.M. Umansky was of great importance.

In 1965, on the basis of GrozORI the SevKavNII was established by the order of the State Committee of Oil Industry of the USSR Gosplan (11 August 1965). By the decree of the USSR Ministry of Oil Industry of 17 March 1970 the institute was transformed into the North Caucasus State Research and Design Institute of Oil Industry (SevKavNIPIneft). The institute was under the jurisdiction of State Committee for Oil Industry in the USSR State Planning Committee (1965); USSR Ministry of Oil Industry (1965-1970); USSR Ministry of Petroleum Industry (1970-1995). The institute had a Stavropol branch. SevKavNIPIneft was engaged in the study of geological structure and oil and gas potential of the region, study of oil, gas and oil deposits, development of scientific basis and design methods for their development, assessment of raw materials, study of oil recovery issues, recommendations for the development of oil industry in the North Caucasus. (Organisational documents, 1965-1976; Research documents, 1923-1981).

And in fact, the city of Grozny became the research center of oil and oil refining industry of the entire North Caucasus. The scientific developments of the Institute in the field of oil and gas geology,

carried out in close cooperation with production geologists V. I. Konovalov, V. A. Matsiev, B. A. Ikhaev and many others contributed to the selection of needed paths and rational complexes of geological exploration (GEW), targeting them at the most promising objects in order to increase the resource base of oil and gas industry.

Of particular importance was the group of paleontologists and stratigraphers headed by A.S. Sakharov. In the 1970's and 1980's, in Grozny, there was a strong and numerous school of paleontologists, mainly on foraminifera. There were also solitary paleontologists specializing in ancient elephants. Seventeen stratigraphic specialists from Grozny were included in the reference book *Paleontologists of the Soviet Union* (Zanin, 1968). Most of them (A. S. Sakharov, P. V. Botvinnik, S. V. Varlamova, T. A. Danilenko, E. F. Frolova-Bagreeva, K. F. Makarieva, A. I. Minin, E. A. Starostin) worked in the geological department of SevKavNIPIneft in different years.

The staff of the geological department of the Institute conducted the research of great theoretical and practical importance.

The main directions of this research are as follows:

- comprehensive studies of deep structure of the earth's crust and the determination of prospects for oil and gas potential of the territory of the North Caucasus;
- determination of the most effective areas of exploration for oil and gas in the North Caucasus;
- paleontological stratigraphic studies;
- quantitative assessment of the prospects for oil and gas potential in the main areas of exploration and calculation of hydrocarbon reserves;
- hydrogeological study of the Meso-Cenozoic deposits of deposits and exploration areas of TSNO;
- study of the geology of TAP by remote methods for the purpose of forecasting hydrocarbon traps.

The research results of the scientists were published in collections of works of GrozORI and SevKavNIPIneft, which were issued regularly since 1946. By the name of collections of works one can judge the scope of research topics (issues in the field of oil and gas geology, hydrogeology, geophysics, geothermal, etc.), research areas (the whole of the North Caucasus and partly of the Transcaucasus), and cut interval (from Neogene to Triassic). SevKavNIPIneft Institute had compiled comprehensive oil and gas exploration projects for the territories of activity of the Grozneft and Dagneft production associations and for the North Caucasus as a whole with the identification of the most effective paths of the exploration work and their rational distribution throughout the studied area in order to find and explore for oil and gas deposits and replenishing the resource base of the region's oil and gas industry.

In the 1990s, even being in very difficult conditions, the staff of the geological divisions of SevKavNIPIneft Institute continued the research in accordance with R&D plan. According to the results of research, dozens of research reports were compiled during these years. At the time of OAO Grozneftegaz establishment in 2001, the SevKavNIPIneft Institute was represented by five research departments (departments of geology, development, economics, etc.). There were very few highly qualified specialists, in each department, who could coordinate the implementation of research in relevant areas. Unfortunately, there was no need for this institute.

It is necessary to mention another scientific institution that functioned in Grozny for a short period of time. In 1971, the Caucasus Branch was established on the basis of Grozny laboratory of the All-Russia Research Institute of Geophysics. On the basis of the latter, in the future, they first created a special design and technological bureau in the field of geophysics and later the Research Institute of Geophysical Research (NIIGI). Design and Technological Bureau in the field of geophysics and NIIGI were mainly engaged in the development of equipment in the area of field geophysics, the study of the problem of enhanced oil recovery of productive layers using new geophysical methods and technologies. The institute carried out a certain amount of research and development work on a contractual basis to merge Grozneft and other organizations (Daykaev, 2013).

In the post-war period, the research was continued at Grozny Oil Institute. From 1946 until the early 1990s under the supervision of a number of well-known oil scientists, a large amount of research and development (R&D) in the field of geology, prospecting and exploration of hydrocarbon (HC) raw materials, oilfield geology and hydrogeology, as well as field geophysics was performed. Coordination of all R&D activities was carried out by the research branch of oil institute. During post-war period, the institute's scientists solved many urgent problems of restoring oil production from conserved layers of Miocene hydrocarbon deposits, prospecting and exploration of new accumulations of oil and gas in the Meso-Cenozoic sediments of the Terek-Caspian Trough (Jafarov & Kurumov, 2010). The main research results in the field of oil and gas geology, geophysics and geochemistry were covered in the collections of papers of GOI published every two years.

The geological exploration department of GOI carried out research in several areas: assessment of the prospects for the petroleum potential of Mesozoic sediment complex; study of the Cretaceous and Upper Jurassic deposits of the Black Mountains; the study of groundwater of oil and gas fields, etc.

According to the results of research a consolidated work of G.M. Sukharev Hydrogeology and waters of oil and gas fields was published in 1959. The prepared summary and structural maps for selected regions of Eastern Ciscaucasia. Geological School of Professor P. P. Zabarinsky was focused on solving the following problems: identifying oil and gas potential of the North Caucasus, Western Kazakhstan, Eastern Siberia and other regions; mathematical modeling of the grid of prospecting and exploration wells, etc. The priority research areas of B. K. Lotiev school were the study of lithology, stratigraphy, geomorphology and tectonics of the North Caucasus, the formation of oil and gas traps, etc. The research interests of G. M. Sukharev school covered a wide range of issues in the field of oilfield geology and hydrogeology: the study of groundwater of oil and gas fields, hydrogeological observation in fields, geothermal studies and the use of groundwater for various purposes. Basic research of geophysical school Itenberg was aimed at improving the methods of geological interpretation of data from the field geophysics, at studying petrophysical properties of rocks, etc. The main results of research in the field of oil and gas geology, geophysics and geochemistry were covered in the collections of papers of the GOI published every two years (Daykaev, 2013).

7. Conclusion

Thus, in the period from the late 1920s to the 1980s oil and gas research center was established in Grozny. Until the beginning of 2000 there were big research and survey institutes - GrozORI,

SevKavNIPIneft, Giprogrozneft, etc. The establishment of these institutes and organizations and the entire infrastructure of oil and gas production, which mainly located in Grozny, was due to the fact that it was during that period when oil and refining industry in the Chechen Republic had been developing rapidly. The annual oil production increased from 1.5-2.0 million tons to 21.6 million tons, more than 85% of oil from the total volume of oil production since the beginning of industrial production mainly from several fields (Starogroznenskoe, Oktyabrskoe, Bragunskoe, Eldarovskoe, etc.).

At the end of 1992, the Academy of Sciences of the Chechen Republic was established. More than 1/3 of initial members of the Academy of Sciences of the Chechen Republic were famous scientists from oil and gas institutes and organizations (GrozORI, SevKavNIPIneft, SOTI, Neftegazpromavtomatika) (Umarov, 2008).

In 2000, in Grozny, the structural unit of the Russian Academy of Sciences (RAS) - Comprehensive Research Institute (CRI RAS) was established. One of those who initiated the establishment and the first head of both of these research institutes was famous scientist, Doctor of Chemical Sciences, Professor Kh.I. Ibragimov. A number of structural subdivisions of the Research Institute of the Russian Academy of Sciences were established mainly at the expense of scientists and specialists from oil and gas organizations.

In work (Gumerov, & Bazhaykin, 2014), the analysis of sectoral research of Russia was carried out on the basis of experience of the development of research in the oil and gas complex of foreign countries with the proposed measures to revive the sectoral science. Further development of research in the field of oil and gas geology for this region is important, since the economic well-being of the Chechen Republic is associated with the stable oil production and the dynamic development of oil and gas production.

In the short term, it is oil and gas that will play a leading role in the regional fuel and energy balance (Dias, 2004). In this regard, it is necessary to strengthen the research and geological exploration in the region.

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