HISTORY OF RUSSIAN OIL AND GAS ENGINEERING

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Abstract — *Oil and gas engineering has always served one of the most important sources of Russian wealth independently from any social system. The inexhaustible wells of Russian oil and gas in Tatarstan, Tyumen and Siberia (and earlier – in Azerbaijan) were always the most reliable sources to pay any debts and to provide its population with a fairly good level of life. The survey of natural reservoirs was always a priority-driven problem supported and funded by the state and independent explorers. In recent times many traditional ways to extract oil and gas and to provide other countries with these sources of energy have suffered a lot of unforeseen and undesirable drastic changes caused by the desintegration of the USSR followed by the formation of new independent states. These processes required the total revision of existing network of pipe-lines and oil plants distribution to let alone the complicated political aspects of this problem..*

Index Terms — Russian engineering school, history of oil engineering in Russia, Russian oil and gas prospecting.

INTRODUCTION

At present, it is rather unpopular in Russia to cite Vladimir Lenin, the founder of the Soviet Russia. Nevertheless, one his aphorism still remains ever-green: "A country's policy is the most concentrated expression of its economy" [1].

The material wealth and prosperity of any country (rather than its cultural heritage) have always been determined and stipulated by its progress in oil and gas engineering. The country's economy depends almost completely on oil and gas engineering and its related technology, logistics and infrastructure. It is always true even if a country has no its own resources – the shortage of these resources may be completely covered by a well-organized import and by a network of logistical structures.

Together with other alternative sources of energy oil and gas industry constitutes the country's fuel and energy complex (FEC) whose development is responsible for the wealth of a given country and functioning of all branches of its economy.

This review is intended to give a relevant information on the development of oil and gas prospecting in Russia and the formation of the corresponding industry from the very beginning to present time. Though it has been mentioned about a close relation of policy and economy, no political and commercial aspects will be considered here. This is a historical essay.

THREE HUNDRED YEARS OF RUSSIAN OIL AND GAS ENGINEERING: FIRST STEPS

The history of oil and gas engineering in Russia goes back to 18th century. It is closely related to the first oil wells in Tatarstan and Azerbaijan known since 10th century. The natural oil was used then for simple lamps, torches and as a wheel lubricant. However, the systematic oil prospecting under a strong imperial guidance was initiated by Peter the Great in 1700 when a special Commission for Mining Affairs (re-named in 1719 into Berg-Collegium) began to develop and coordinate research on oil and gas occurrence. Actually the scope of its concern was very wide and included geological survey, miming industry and metallurgy. In fact it was an industrial ministry.

Gottlieb Schober, Doctor of Medicine from Germany was on service in Russia since 1713 as a personal doctor of Peter's sister Natalya. He received from the Emperor an instruction to go to Northern Caucasus in order to carry out research of local mineral waters on the subject of their curative properties. He did his work brilliantly and the results were beyond all expectations. One of those was the detailed map of oil sources together with his recommendations how to separate it from water. His map dated by 1717 is unique and kept in the Library of Russian Academy of Sciences.

FIGURE 1
MIKHAIL LOMONOSOV

In the year of 1725 the *Academy of Sciences* was established in St. Petersburg. Many outstanding European scientists such as Leonard Euler or Daniel Bernoulli served as professors for the benefit of Russian science and education. Mikhail Lomonosov (1711 – 1765, see Fig. 1) became the first Russian Academician.

He was the first who delivered in Russian lectures of Physics, Chemistry and Mechanics. His contribution into the national engineering was tremendous: stained glass

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technology, theory of heat, machinery, metallurgy, optical engineering, geology and mining.

It was his idea to organize in 1760 some expeditions to Volga Basin, Urals and Siberia to conduct a very wide scope of natural research.

His instructions were as follows:

- To investigate the nature of soil and water;
- To investigate diseases of people and cattle;
- To keep weather recordings;
- To describe local minerals, flora and fauna.

As a result a lot of oil sources were discovered in subsequent years in Tatarstan, Bashkortostan and Siberia.

FIGURE 2
IVAN LEPEKHIN

Ivan Lepekhin (1740 – 1802) was the Head of one of those expeditions who made the greatest contribution in oil explorations (Fig. 2). His reports and oil samples were presented to St.-Petersburg and thoroughly analyzed there.

Independently from these expeditions the first in Russia oil refinery was established by Fedor Pryadunov in 1745 near Ukhta river in Komi Region at Urals mountains. Ivan Lepekhin with his expedition visited this place and gave its full description which confirms the status of a real oil refinery.

However, at the beginning of 19th century it became clear that a real progress could only be achieved by well-drilling.

RUSSIAN OIL AND GAS ENGINEERING BEFORE THE OCTOBER REVOLUTION OF 1917

The real oil prospecting engineering began in Russia in the mid 19th century.

In all western sources Edwin L. Drake (1819-1880) is known as the 'Father of the Petroleum Industry'. According to these sources he was the first who implemented into practice the method of industrial well-drilling in 1859 in Pennsylvania.

Nevertheless the well-drilling method to extract oil for the first time was implemented in Russia. The first project of well-drilling was proposed by F. Semenov, a Russian engineer. His revolutionary project was being considered for four years in various ministries. At last, the first well was drilled in 1848 in Baku, Azerbaijan. However, no oil was discovered at that place and the project was forgotten until the first success of Drake's project in 1859. Then, the works on Semenov's project were resumed in Russia. This time the attempts were very successful and a lot of oil was extracted in various wells in Azerbaijan.

Oil and gas engineering in Russia was really booming when in 1870s Nobel brothers from Sweden made their investments into Russian oil industry. They established "Nobel Brothers' Association of Oil Industry" with headquarters in Baku and St.-Petersburg. Owing to their efforts the first pipelines and tankers for oil transportation were constructed. Although Alfred Nobel (born in 1833 in Russia where his father worked then) is world-known because of his invention of dynamite which gave the base for annual prizes in science, ten per cent of this capital are due to his investments into Russian oil industry [2].

Investments of foreign companies and generous governmental support resulted in increase of oil pr4oduction by 416% within the period from 1874 to 1878. Further increase of oil production in comparison with the USA and export oil dynamics are illustrated by Fig. 3 and Fig. 4 [3].

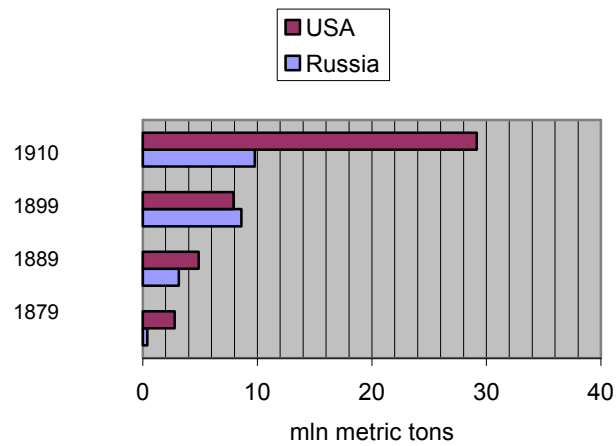

FIGURE 3
OIL PRODUCTION IN RUSSIA AND USA, 1879 - 1910

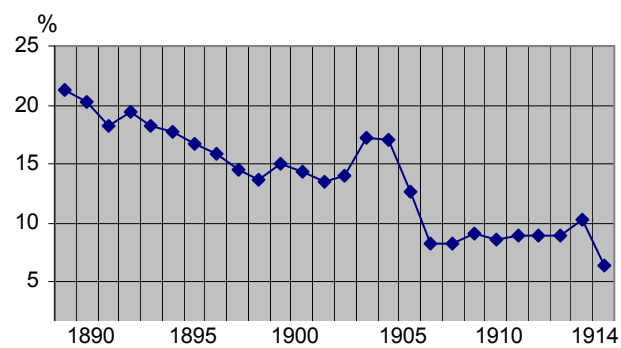

FIGURE 4
RATIO EXPORT/TOTAL (%)

It may seem that the fall of oil export as it becomes clear from Fig. 4 indicates to some drawbacks of Russian economy. On the contrary, it proves the growth of Russian economy: the oil was demanded for domestic industrial use; in particular, for a new automobile industry which was growing rapidly at the beginning of the 20th century. The flat part of the graph (1906 – 1913) proves the stability of Russian economy in this period which follows the period of instability provoked by some internal problems in 1903 – 1905 increased by unsuccessful action of Russian government during the Russian-Japanese war of 1904 - 1905. A strong input of foreign currency was necessary and the maximum of the graph explains the situation.

THE SOVIET PERIOD (1917 – 1991)

This period was really very difficult for the Russian economy.

The complete disorder after the October Revolution in 1917 provoked the general decline in oil production. Nevertheless, the total production of oil in the Soviet Union reached 33 *mln metric tons* in 1930s, just before the war of 1941. This very period is known in the USSR as the period when the engineer V. Shukhov has realized all his inventive gift.

Vladimir Shukhov (1853 – 1939) belongs to a new generation of Russian engineers of the Soviet era. He is one of inventors of 'cracking' process in petrochemical technology. The cracking process means splitting of carbohydrate molecules to produce the greater output of petroleum. Vladimir Shukhov was the first who realized a torch-flame combustion of fuel by means of a special injector with pulverized fuel.

FIGURE 5
VLADIMIR SHUKHIV

Another sphere of his gift was civil engineering. He erected a lot of tracery cobweb-like bridges and towers. The best of them is his unique tower constructed in Moscow in 1922 and intended for radio-broadcasting.

Only 19 *mln metric tons* were produced in early fifties, just after the war.

THE POST-SOVIET PERIOD (SINCE 1991)

The desintegration of the Soviet Union in 1991 and the establishment of a new capitalist system on its territory resulted in many changes in its economy, particularly in oil and gas industry. The main feature of this period was the export of the capital abroad rather than the investments into the national economy. The dealers in oil industry received from the government a "carte blanche" to sign their export contracts without any control from the state. A lot of brand-new oil companies appeared and began to act.

Some new giant companies were created in 1988 – 1991: "GASPROM", "LUKOIL", "NORILSKY NICKEL", "TATNEFT", "SIBNEFT" and oth.

The overall situation in oil and gas industry is shown on the Fig. 6.

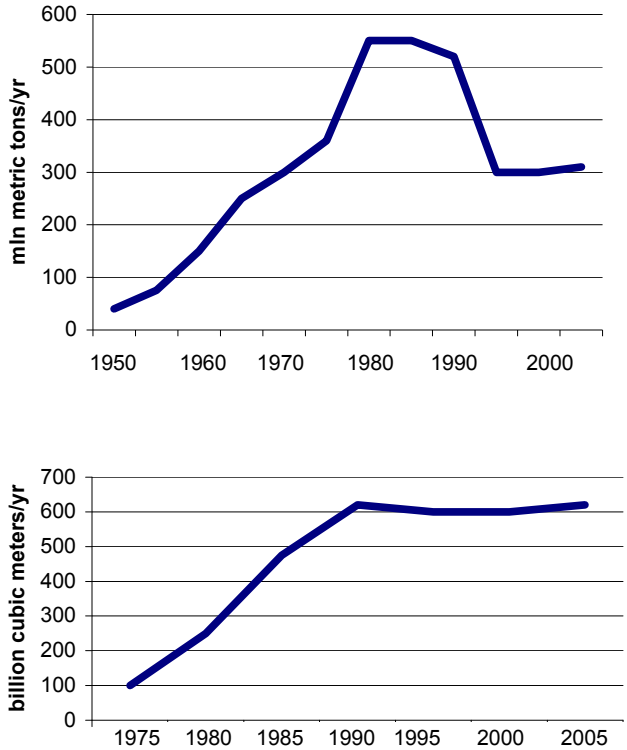

FIGURE 6
OIL (TOP) AND GAS (BOTTOM) PRODUCTION IN POST-WAR PERIOD

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