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DEVELOPMENT OF THE OIL INDUSTRY IN THE USA (PART I)

The article looks into the history of the oil and gas industry which has been dynamically developing today. Oil and natural gas as well as their processing products have a very long history of use by mankind though the history of the world oil industry counts about as few as 150 years and the gas one less than 100 years. The authors intend to write a series of articles covering the history of the world oil industry, aimed at understanding the "anatomy of success" which is much needed for the domestic industry. This series of articles begins the exploration of the USA oil industry development.

Key words: *oil; natural gas; oil and gas industry; development history; USA.*

Problem definition. Oil and natural gas as well as their processing products have a very long history of use by mankind though the history of the world oil industry counts about as few as 150 years and the gas one less than 100 years. Despite such relatively "young" age, oil and gas have become a determinant in the development of global economy, financial markets and political processes in numerous countries (sometimes in a latent form). The «information field» around the oil and gas industry is therefore invariably in the spotlight of the general public and demands of specialists thorough understanding of the historical development and prospects of oil and gas production. Historically, the oil industry development was related to a revolutionary invention of kerosene (Johan Zeg, Lviv, 1853) and world new demand for «big oil» for illumination of premises and city streets. Technically, industrial oil production was based on downhole technologies for oil discovery, use of steam engines for drilling wells, pumps for running oil and powerful oil refineries, but at the first stage it «coexisted» with traditional well oil production (except for the USA). Geographically, the world oil industry originated in the 1850s-1860s in three centers - the Carpathian region (Galicia and Romania), Pennsylvania (the USA) and Apsheron (Azerbaijan). However, it was in the USA where in a short period of time the most dynamic, innovative and world market oriented oil industry was developed, which maintained those trends throughout the 20th century. Modern US policy is aimed at global energy leadership through development of domestic fields, which has lately been a new feature of the industry. Based on the above, the historical experience of the US oil industry development assumes particular importance and attracts wide public interest.

Level of problem research. The history of the world oil industry, in particular the development of the US oil industry, has not been covered by system studies of Ukrainian researchers and is only fragmentarily dealt with in some publications [*Гайко, Білецький, 2013; Шнюков, 2008*]. Publications of the former USSR [*Тьюгендхэт, Гамильтон, 1978; Фурсенко, 1985,* etc.] were primarily focused on political aspects of the issue and were often committed to a «party vision». Translated American manuals and studies dealing with technological issues of oil production [*Хайн, 2017; Грей, 2003*] covered some aspects of the history of technology and its creators but did not aim to present the history of the oil industry. Problems of the global and American oil industries have been studied in reasonable depth by American researchers [*Marius, 2018; Bringhurst, 1979; Chernow, 1998 et al.*] but the latter are almost unfamiliar to Ukrainian audience. Unlike Ukrainian publishing houses, those in Russia find some opportunities for translation of the most important works by American «oilmen» and Ukrainian readers familiarize themselves with such Russian translations [*Ергин, 2011; 2016; Экономидес, Олини, 2004*]. These are however still focused on geopolitical aspects of oil production. Some publications deal with leading personalities in the world oil industry, who deserve attention and understanding [*Меснянко, 2015*].

Object of the article. The authors intend to write a series of articles covering the history of the world oil industry, aimed at understanding the «anatomy of success» which is much needed for the domestic industry. This series of articles begins the exploration of the USA oil industry development.

Presentation of the basic material. North American Indians, particularly the Seneca tribe, knew about mysterious places of oil seepage long ago and considered them sacred. They made special wells there and collected oil from the water surface with blankets, squeezing it into vessels. In 1627 the Seneca Indians showed their sacred wells to the French Catholic missionary Joseph de La Roche Daillon and told about the properties of that mysterious liquid, specifically about its power to support the burning of torches. The priest blessed those amazing places and wrote about the latter and «Seneca Oil» to ecclesiastical authorities in France. The oil seepage places were found by the Indians on the lands of the present-day Cattaraugus and Allegany counties in the

south-west of the State of New York (before the 18th century they had been a part of the Pennsylvania Colony). The event was the first recorded oil discovery on the North American Continent. There had remained however about two and a half centuries before the beginning of commercial field development.

In 1854 the Canadian doctor and geologist A. Gesner patented in the USA a technique for producing illuminating oil from coal, which he called «kerosene» (as translated from Greek - «wax oil»). The quality of that product was poor but a high cost of whale oil for lamps contributed to the spread of the new fuel on the market. In the same 1854 the New York lawyer John Bissell and the banker J. Townsend developed an ambitious project for creation of an oil industry in the USA to replace coal kerosene and organic illuminating oils with refined petroleum products. They also set up *the Pennsylvania Rock Oil Company,* the first American oil production company which eventually changed its name to *Seneca Oil*. The founders and early investors were aware of numerous seeps of «mountain oil» (oil) along the Oil Creek River in northwest Pennsylvania, where small quantities of oil were collected from the surface of brooks and used as a medicinal raw material. It was natural to expect to find oil in large quantities there. But was it possible to get high-quality illuminating oil from that oil? Entrepreneurs turned to B. Silliman (Jr.), a chemistry professor at Yale University, with a request to examine oil and its refining products as illuminating and lubricating materials (the history has even retained the fee amount - 526 dollars). A report of the scientist, dated 16 April 1855, was submitted to the customer company with a statement of the potentiality of obtaining high-quality lamp oil. That was the first step in the oil business development in the USA, which had an impact on the march of world history due to the unprecedented dynamics of its development.

There is no reliable evidence of whether the initiators of the oil business in America knew about the invention of kerosene by the Lviv dweller J. Zeg and the use of kerosene in the Austrian Empire. According to the authors, they could have known because after several unsuccessful attempts to make their own kerosene lamp, they started importing the latter from Vienna (as designed in Lviv by Lukashevich and Bratkovskyi). And after some minor design changes had been made, the USA started to mass produce those lamps and export around the world. Despite the European (Lviv) priority of kerosene and a kerosene lamp, it was the USA rather than Austria, which as early as in the 1860s dominated the world market of kerosene, offering it to all countries (which was even made state ambassadors' duty). The above shaped public opinion regarding America as the country-inventor of kerosene and the sole creator of the oil industry (some authors still use this largely preconceived thesis now).

The first steps of the American oil production are full of dramatic confrontation between the pioneers of the new business and the «great unknown» in the bowels of the earth as well as traditional skepticism of public opinion in respect of a new business set up by beginners. In summer 1856 J. Bissell decided to employ downhole techniques, used for extraction of brines, to prospect for and produce oil. At the time there were few oil upwelling attempts made in America and Canada, which were not much a success, and it was greatly doubtful that the downhole technology would suit the purpose in the first place. Investors thought that pumping oil out of the ground as water was madness and refused to finance such projects (oil was then considered special viscous bleedings of coal seams).

In 1857 *the Pennsylvania Rock Oil Company* hired one of its minority shareholders, the railroader Edwin Drake, to prospect for promising oil production areas. To enhance the Company status and enlist cooperation of local authorities, he was named *Colonel Drake* in accompanying documents (Drake went down in the world history of oil production with that «mythical» title). In December he arrived in a small loggers' village of Titusville in the north-west of Pennsylvania, explored the local neighborhood and registered an area, two miles away from the village downstream the Oil Creek, in the name of the Company.

In spring 1858 Drake came to Titusville, as a general representative of *Seneca Oil* (the refounded *Pennsylvania Rock Oil Company*), and started prospecting work. At first they dug prospecting pits (wells) which yielded no intended effect. With the money received from investors, there were a steam engine and drilling equipment installed from salt mine experience. The drilling was started only the next spring. They had no experience, had been looking for a specialist in drilling for a long time (hired the locksmith A. Smith), the credibility of the business was minimal and the stubborn Drake was considered crazy by the workers. The drilling process was difficult and at a depth of about 5 m the well walls began to close up so Drake decided to ram the pipes (thus inventing and for the first time successfully applying a drilling technique with well casing). At the end of August 1859, the Company management gave up the last hope and sent a letter with a cheque to close down. The letter came the second day after America's oil had been discovered! On August 27 the boring bit sank into empty space at a depth of about 21 m and the next morning oil began to run to the surface. Having installed a manual pump at the well, the workers began to pump out oil, filling various barrels, bottles and other containers. What many thought was a fantasy, turned out to be possible. The news spread the neighborhood almost instantly and gave rise to the *oil rush*, in many ways similar to the *gold rush* in California. The small Titusville boomed, turning into the first American oil production center.

Edwin Drake became a recognized authority in the oil production industry and later the first broker with the New York Stock Exchange which specialized in stocks of oil companies but he went bankrupt and died nearly a beggar. John Bissell, the organizer and «engine» of the business, having borrowed much money, managed to buy the largest sites around Titusville and won, becoming one of the richest people in America. The banker G. Townsend who ran the risks of financing the project in the hardest times was not that fortunate and considered himself unfairly deprived.

As early as in 1860, there was an Oil Region along the Oil Creek established, with 75 wells and 15 rigs for processing crude oil into kerosene run, the total production that year coming to 450 thousand barrels. In 1861 drillers came across the geological conditions of oil *springs* (oil well flowing) for the first time, which dramatically increased the scale of production. The latter reached 3 million barrels in 1862.

The eightfold production growth within two years resulted in slump of oil prices and put kerosene beyond competition, compared to other illuminating oils which quickly disappeared from the market. Kerosene offered the *light of the new era*, its distributors becoming a habitual attribute of American cities.

During the civil war in the USA (1861 - 1865) the northern states were deprived of foreign exchange proceeds from sales of cotton (the traditional export of the southern states) and quickly developed the export of kerosene into different countries of the world, even Europe where high-grade kerosene had been produced from Carpathian oil before the American one.

The main center of industrial oil refining was established in the city of Cleveland, the State of Ohio (about 100 km west of the border with Pennsylvania). In February 1865 the largest oil refining company in Cleveland was passed into sole proprietorship of John Rockefeller (he took over a part of the company from his partner M. Clark). The above initiated the monopolization of American oil production and creation of modern world corporations. In 1866 Rockefeller set up another company in New York for kerosene export and trade on the Atlantic coast.

In 1870 the renowned joint stock company *Standard Oil* was set up on the basis of *Rockefeller, Andrews and Flagler* with a seed capital of 1 million dollars. It was focused on refining, transportation of and trade in oil and its processing products (initially, the production was not among its priorities). The name of the company meant a standard quality of the product. Rockefeller and Flagler developed a concept of defeating competitors by controlling the rail transport of oil. They gained rail carriers' interest with a cartel agreement under which only members of the cartel (mostly *Standard Oil* companies) enjoyed transportation discounts. Moreover, in case of transporting other companies' oil the railways had to pay compensation (a quarter of the freight) to Rockefeller. It became clear soon that shortly there would be only one buyer left for the entire Oil Region. Rockefeller's biographer wrote: «Out of all the ways of suppressing competition, which had been ever planned by a group of American industrialists, that one was the cruelest». The first American *oil war* broke out.

Numerous production cooperatives, small companies and well drillers came together and started boycotting processing and transport companies, many of which went bankrupt whereas their businesses were covertly bought up by *Standard Oil*. The first stage of the *oil war* ended with a victory of oil producers, the attempts to keep the transport monopoly failed. But in 1872 Rockefeller was already the owner of most refineries in Cleveland and New York, having created the largest oil refining corporation. In 1879 he controlled as much as 90% of American oil refining capacities and aimed to lead the global oil industry.

Thus, free rein of American oil production was pinned down to the fact of the oil refining monopoly. Numerous oil producers which still resembled prospectors of the *gold rush* times tried however to escape from grasp of *Standard Oil* through construction of the first long-distance pipeline (the short ones had been built since the 1860s), which was supported by the administration of Pennsylvania. The project of the *Coastal Pipeline* with a length of 110 miles was intended to connect the Oil Region with the Redding railway. Rockefeller's people naturally did their best to avert the construction (descending even to organization of gang attacks on the builders). Despite their efforts, in May 1879 the first oil ran through the pipeline. The above became an outstanding technological achievement (which started a crucially new stage in oil transportation) and at the same time jeopardized the monopolistic position of *Standard Oil*.

To prevent the defeat, *Standard Oil* shortly built its four oil pipelines from the Oil Region to Cleveland, New York, Philadelphia and Buffalo, creating the first oil pipeline system of the USA. Some court charges with market monopolization and unfair competition forced the Company to restructure and set up an advanced form of a trust, which was formalized through a trust agreement in 1882. Quite a few companies, former competitors, joined in with the trust, becoming a part of an integrated efficient system. In 1885 *Standard Oil* moved its headquarters to New York, Lower Manhattan, stationing itself in the office building on the site of 26 Broadway, which became a symbol of the *new America*.

In the same year, the Geological Survey of the Pennsylvania State warned of a significant reduction (depletion) of the available oil reserves and near-term prospects for curtailing oil production. Some *Standard Oil* shareholders began to sell off company shares below par. It seemed that nothing short of a miracle could prevent the collapse of the Company... and the miracle did happen. There was new rich oil discovered (the Oil Region of Lima-Indiana) in the north-west of Ohio. In 1886 the oil production industry for the first time went beyond the State of Pennsylvania and within a year of operation the Lime fields yielded such production volumes that the oil price in the USA fell almost thrice.

All the above circumstances, particularly the instability of production volumes, leaps in and drops of prices, inadequate technical equipment and organization of the oil field development, put Rockefeller onto an idea of changing the Company concept and entering the sphere of oil production. His motto «we buy everything we can» resulted in rapid reorganization of the extracting industry. In 1891 *Standard Oil* owned as much as 25% of crude oil production in the USA. Creating and directing his vertically integrated company into the future, Rockefeller pointed out: «All things offer an advantage of large-scale work». The company history opened the first chapter in the development of the US oil industry - setting-up of a giant global enterprise, which largely transformed the American life of the time.

Conclusions

Assessing the oil industry development in the USA, as compared to the chronologically first oil industry of the Carpathians, we can sum up that despite the lack of strong development traditions and well known fields with artisanal well extraction (which served as a road sign to Ukrainian and Romanian oilmen in industrial expansion of production), American oil prospectors and especially the oil refining industry (which controlled the kerosene market) ensured a fast development of the industry, outpacing the semi-feudal Austrian Empire. The above was the result of not only more advantageous geological conditions (the vast majority of American wells were guster holes) and rapid introduction of the drilling technology with appropriate equipment (steam engines, pumps, casing pipes) but also more favorable social conditions of running business, trade, minimized bureaucratic arbitrariness etc. The USA was a maritime power, its advanced fleet and international trade relations establishing a significant superiority over the continental Austria in exports and build-up of international kerosene markets. Tribute should be also paid to ideologists and founders of the first US oil companies - J. Bissell (*the Pennsylvania Rock Oil Company*) and especially J. Rockefeller (*Standard Oil*), where the scale of thinking and business organization were of much higher caliber than those of their colleagues from Central and Eastern Europe. These advantages proved to be particularly convincing in the 20th century.

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СТАНОВЛЕННЯ НАФТОВОЇ ПРОМИСЛОВОСТІ В США (ЧАСТИНА І)

Стаття стосується історії нафтогазової галузі, яка сьогодні динамічно розвивається. Нафта і природний газ, а також продукти їх переробки мають дуже давню історію застосування людством, проте історія світової нафтової промисловості налічує всього лише близько 150 років, газової - менше 100 років. Завданням авторів є серія статей, присвячених історії світової нафтової промисловості задля розуміння "анатомії успіху", так потрібного вітчизняній промисловості. Цей цикл статей розпочинаємо дослідженням становлення нафтової промисловості США.

Порівняльний аналіз становлення нафтової індустрії в США і нафтової промисловості Карпат показує, що незважаючи на відсутність сталих традицій розробки і здавна відомих родовищ з кустарним колодязним видобутком (які слугували українським і румунським нафтовикам дороговказом для промислового нарощування видобутку), американські нафтові "старателі" та особливо нафтопереробна галузь забезпечили швидкий, випереджаючий напівфеодальну Австрійську імперію розвиток промисловості. Це було зумовлене не тільки перевагами геологічних умов (переважна більшість американських свердловин були фонтануючими) та швидким впровадженням технології буріння із застосуванням відповідної техніки (парові машини, помпи, обсадні труби), але й більш сприятливими суспільними умовами ведення бізнесу, торгівлі, зведеного до мінімуму бюрократичного свавілля тощо. США були морською державою, їх розвинений флот і світові торговельні зв'язки створили значну перевагу над континентальною Австрією в справі експорту й формування міжнародних ринків гасу. Належне слід віддати й ідеологам та творцям перших нафтових компаній США - Дж. Бісселу ("The Pennsylvania Rock Oil Company") та особливо Дж. Рокфеллеру ("Стандарт ойл"), масштабність мислення й організації справи в яких були значно більшого "калібру", ніж у їхніх колег з Центрально-Східної Європи. Ці переваги виявилися особливо переконливими в XX ст. і обумовили успіх розвитку нафтової промисловості в США.

Ключові слова: *нафта; природний газ; нафтогазова галузь; історія розвитку; США.*

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