

Formation and Development of Kazakh Oil

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Abstract. The history of formation and development of the Kazakhstan oil from the beginning in 1899 to the present stage is shown. As the first historical criterion of availability of oil serve names of toponyms, the second – the corresponding legends. Notes and diaries of travelers and also reports of the expeditions sent to the region of the Western Kazakhstan serve as also important historical evidence. Data on time and a location are submitted to the first oil well in Kazakhstan and stages of development of the oil industry till modern time. Perspective ways of development of the oil industry of Kazakhstan are given.

Keywords: Kazakhstan, Emba, exploration, oil, reserves, production, history, stages of development, ways of further development, digital field.

Introduction

Various manifestations of oil and its natural derivatives on the earth's surface in Western Kazakhstan have been known since ancient times. This is evidenced by the numerous Kazakh names of oro- and hydrographic objects [5]: tracts, springs, streams, wells, etc., such as Zhaksimay (good oil), Karaarna (black channel), Karamay (black oil), Karaton (hardened black soil), Karashungul (black hollow), Maykomgen (oil burial place), Maytobe (oil hill), Munayly (oil), etc.

In addition, the oral tradition «On Holy Lights», which once burned in the Auketai-Shagyl region, was confined to the time, confined, as it turned out later, to the exits from the bowels of the surface of combustible gases with their spontaneous combustion and long burning [2].

Currently, Kazakhstan is one of the oil-producing countries in the world in which oil was commercially produced at the end of the 19th century, even much earlier than in Iran, Kuwait, Mexico, Norway and Saudi Arabia [5].

Theory of the question

Detailed geological study of the territory of Western Kazakhstan began in the second half of the 19th century [7], when the primary characterization of the climatic features of this territory was carried out and some mineral deposits were described, usually at that time having a natural exit directly to the day surface.

In November 1899, the first oil fountain (with a daily flow rate of 22-25 tons, totaling more than 5 thousand tons of oil) appeared in the Karashungul tract of Kazakhstan from the well No. 7 with a depth

of 40 m, thereby putting the beginning of the Kazakh oil period [4]. Another 20 wells were drilled in 1908 at the Karaton domed oil-containing structure.

In 1908, at the Iskine oil field, the oil producer Stakheev in well No. 5 received a light oil fountain from a depth of 228 m, with a daily production rate of about 8 tons. Subsequently, in the 1916-1917s. Emba-Caspian company laid 14 boreholes with an average depth of 150 meters on Karashungul.

On April 29, 1911, a powerful oil fountain appeared from well No. 3 in the Dossor tract, the stream of which rose to a height of 20-25 m. Its quality turned out to be quite good: the kerosene content (at that time in the development of technology, the most demanded oil component used by the population for lighting premises) exceeded 70%. This was the beginning of large-scale industrial oil production at Emba. Two years later, the Makat field was discovered in the Guryev (now Atyrau) region [5], where, together with Dossor, by 1914 more than 200 thousand tons of oil was produced.

This significant practical result attracted the attention of other oil producers to this area and in 1911-1919, with the direct participation of English capital, large joint

- stock oil companies were formed [7]. At the very beginning, Kazakhstani oil was produced in a fountain way, then, as the self-draining of production wells was exhausted, oil was pumped out from the recesses specially excavated at their mouths by tarding (from the Azeri dartmag – pull, pull out) using a bailer (Figure 1) [5]. This primitive method of oil production has been used on Emba for over 20 years.

In addition to the development of geological surveys, the oil industry of Kazakhstan introduced



Figure 1 – Bailer

in the oil fields fundamentally new technologies and techniques for drilling and oil production. So, in the second half of the 20s. XX century (for the first time in the USSR) Emba oilmen began to use rotary drilling, which contributed to the development of drilling operations, as well as increased depth of wells, the rate of opening, exploration and development of oil deposits [4, 5]. As a result of this, the average well depth from 196.7 m in 1929 increased to 637.7 m in 1932. In addition, the Emba oilmen were the first in the USSR and Europe to develop ultra-deep drilling of that time in Dossor (Figure 2) and Makat to depths of 2500-2800 m.

By the end of the 20s in the 20th century, exploration was significantly expanded: 135 geological and geophysical parties were engaged in the study of oil fields in Western Kazakhstan for 5 years. This led to a significant increase in the volume of geological exploration work [5]. For example, if in the initial period 42,328 m³ of wells were drilled

(an average of 5300 m³ per year), then after 1920, 284 thousand m³ were drilled (an average of 20,600 m³ per year). As a result, from 1920 to 1929, 1630 thousand tons of oil were produced at the oil fields of the Ural-Emba region, i.e. 19% more than its amount obtained for the entire pre-revolutionary period.

By the end of 1940, the oil fields of the Ural-Emba region produced 750 thousand tons of oil.

During the Great Patriotic War in Kazakhstan were:

- Zoldybai, Komsomolsk, Koshkar and Tenteksor oil fields were put into commercial operation;
- the Komsomolsk-Makat and Koshkar-Sagaz oil pipelines were built;
- a steam turbine power station was built and commissioned in Kamyskul (near the town of Kulsary) and the Guryev oil refinery.

In the post-war years, it was decided to territorially expand geological exploration and begin to study the already deep-seated deposits of the Triassic of the Ural – Volga interfluvium, as well as the coastal zones of the Caspian region [3].

In 1960, the Prorva oil field was discovered, which became the largest discovery in the Emba oil history of that period. The further discovery in 1961 of the largest oil fields Zhetybai and Uzen (which led to an increase in proven oil reserves by 20 times, annual production by 14 times) gave rise to a new oil and gas production base in Kazakhstan at Mangyshlak. As a result, oil production in this period reaches 2 million tons per year.

In the 70s of the twentieth century, large deposits of Karazhanbas, Northern Buzachi and Kalamkas were discovered. As a result, by 1974, oil production reached 21 million tons per year.

From the mid 80s of the twentieth century until the end of the twentieth century, 84 more oil fields were discovered in the Atyrau region, including 2 subsalt ones (including Tengiz, which has the status of a unique field). In particular, in terms of initial recoverable oil reserves, the Tengiz field is second only to the Samotlor field in Tyumen (RF) in the CIS.



Figure 2 – Oil field at Dossor

It should be noted that there was a severe fire at this field (a column of flame reached 200 meters in height and 50 meters in diameter – Figure 3, at a temperature reaching 15,000°C, and 12-15 thousand tons of oil and 6-8 million were burned daily. m3 associated gas).

At the end of the 20th century, the vector of geological exploration and oil production in Kazakhstan moved to the shelf of the Caspian Sea. So, until 1993, 39 exploratory wells were drilled at 11 offshore structures, where oil and gas inflows were obtained [6, 1]. As a result, 36 deposits and 374 geological structures have already been explored on the Kazakhstan shelf of the Caspian Sea, which

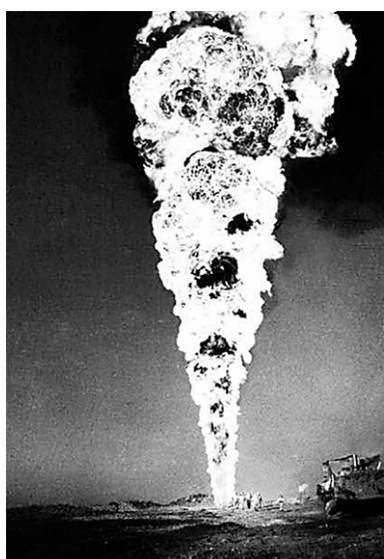


Figure 3 – Fire at an oil well

consists of 6 oil and gas bearing blocks (the estimated resources of which are estimated at 8 billion tons of standard fuel, including 4.5 billion tons of oil).

Another Kazakhstan offshore project is the development of 2 coastal marine blocks off the coast of the Kurmangazinsky and Isatai regions of the Atyrau region and includes the exploration and development of the subsalt structure of South Zhambay and a number of suprasalt structures, including South Zaburye [6]. Work on these blocks is carried out by JSC NC «KazMunayGas».

A very important achievement of the oil industry of Kazakhstan, obtained during the years of independence, is an intergovernmental agreement signed in 1993 with Russia, which later became the Convention on the Legal Status of the Caspian Sea (Figure 4) – an international agreement between the 5 Caspian littoral countries (Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan), signed on August 12, 2018 as part of the Fifth Caspian Summit in the Kazakh city of Aktau.

During the 20-year discussion, the Caspian countries managed to make the most optimal joint decision regarding the delimitation of the bottom and bowels of the Caspian Sea, the navigation regime in territorial and inland waters, the laying of pipelines along the bottom of the Caspian Sea, and free access to the seas and oceans.

Currently, the Republic of Kazakhstan occupies the 9th place in the world in terms of explored oil reserves [7]. Thus, recoverable reserves of 278 Kazakhstani fields developed and prepared for development amount to 5.2 billion tons of oil.

At the same time, oil and gas regions occupy more than 60% of the republic's area. The main



Figure 4 – The Caspian Sea demarcation scheme

carbon reserves are concentrated in the giant (over 1.5 billion tons of oil) Kashagan and Tengiz fields, as well as Karachaganak and Uzen.

The discoveries of recent years, which are the structures of the subsalt complex of the Caspian Basin, have also allowed a noticeable increase in hydrocarbon reserves.

As a result of the development of these oil resources, Kazakhstan is in 26th place among countries that extract hydrocarbon raw materials, receiving in 2018 about 90 million tons of oil.

Significant oil reserves in Kazakhstan have led to an increase in the number of oil companies operating in the industry. Currently, oil companies in Kazakhstan are quite numerous (over 300) – from very large transnational corporations to rather small companies.

Kazmunaigas is the largest national oil and gas company in Kazakhstan for the extraction, exploration, refining and transportation of oil. The assets of Kazmunaigas include KazakhOil-Aktobe (67%), Mangistaumunaigas (50%), PetroKazakhstan (33%), Tengizchevroil (20%), KazMunayTeniz (20%), Kashagan (16.81%) and others.

The length of the pipeline network of Kazakhstan is 7277 km. Currently, there are 3 main oil pipelines. Over 11 million tons of oil is transported by the Caspian Sea through the port of Aktau, and about 5 million tons are exported by rail.

There are 3 large oil refineries in the Republic of Kazakhstan: Atyrau, Pavlodar and Shymkent. Their total capacity is 18.5 million tons of oil per year, with an average refining depth of 65.3% [3].

The further development prospect of the oil industry of Kazakhstan is determined by 6 main activities (table).

It is necessary to ensure an increase in the oil recovery coefficient: an increase of only 1% will lead to an additional production of 10 million tons of oil in Kazakhstan as a whole.

Another important factor in the development of Kazakhstan's oil industry is the use of the «digital

field / digital oil field» ideology, the emergence of which was due to the development of remote control technologies for «smart» wells, on the one hand, and the economic feasibility of automatically converting them to an integrated one based on the oil the optimal regime for the field (which is not possible without the constant use of mathematical modeling involving extensive geology data and the entire previous history of the development of the object).

Digital oilfield involves combining several innovative technologies for oil exploration, production and transportation (including special software containing a set of applications that describe the behavior of the oil field on a computer with visualization of this process), as well as digital control of individual wells, a group of wells and the oilfield generally provided by existing communication technologies.

The technology of the «digital» oil field involves the installation of recording equipment (special sensors) at all nodes of oil production, collection, primary processing and transportation of oil, which will take the values of technological parameters and transmit them online to the dispatching office of Embamunaigas JSC, where the operator will be able to quickly make the most optimal technological decision.

Conclusion

Based on the above, it can be concluded that the information about the initial oil potential of the Kazakh land obtained by Russian scientists and entrepreneurs allowed to attract the attention of Russian and foreign oil producers. This was the impetus for the development of oil exploration in Kazakhstan and the development of deposits. Today, the oil and gas industry of Kazakhstan continues to develop. At the same time, a high percentage of investment inflows into this industry remains, which is primarily due to the formation of global demand for oil and gas as the most important source of energy.

Further prospects of Kazakhstani oil [1]	
Events	Effectiveness
Increase in oil recovery coefficient	Increase of hydrocarbons up to 30 %
Search and exploration of deep-lying deposits (deeper than 8 km)	Increase of hydrocarbons by 3 times
Search and exploration of deposits in non-anticline traps	18-20% increase in oil
Search and development of aquatic gas hydrate deposits	Increase in combustible gas
Digitalization and intellectualization of oil fields, pipeline systems and refineries	8-12% increase in oil
Transition to nanotechnology	8-15% increase in oil

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Қазақстандық мұнайдың қалыптасуы мен дамуы

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Аңдатпа. 1899 жылдың басынан қазіргі кезеңге дейінгі Қазақстан мұнайының қалыптасу және даму тарихы көрсетілген. Мұнайдың бар болуының алғашқы тарихи критериі ол топнимдардың атауы, екіншісі – сәйкесті аңыздар мен дәстүрлер. Саяхатшылардың жазбалары мен күнделіктері, сондай-ақ Батыс Қазақстан өңіріне бағытталған экспедициялардың есептері де маңызды тарихи айғақ болып табылады. Қазақстандағы алғашқы мұнай ұңғымасының уақыты мен орналасқан жері және мұнай саласының қазіргі уақытқа дейінгі даму кезеңдері туралы мәліметтер ұсынылған. Қазақстанның мұнай саласын дамытудың перспективалық жолдары берілді.

Кілт сөздер: Қазақстан, Эмба, геологиялық барлау, мұнай, қорлар, өндіру, тарихы, даму кезеңдері, одан әрі даму жолдары, цифрлық кен орны.

Становление и развитие казахстанской нефти

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Аннотация. Показана история становления и развития казахстанской нефти от начала в 1899 г. до современного этапа. Первым историческим критерием наличия нефти служат названия топонимов, вторым – соответствующие легенды и предания. Также важным историческим свидетельством служат записки и дневники путешественников, а также отчеты экспедиций, направленных в регион Западного Казахстана. Представлены сведения о времени и месторасположении первой нефтяной скважины в Казахстане и этапы развития нефтяной отрасли до современного времени. Даны перспективные пути развития нефтяной отрасли Казахстана.

Ключевые слова: Казахстан, Эмба, геологоразведка, нефть, запасы, добыча, история, этапы развития, пути дальнейшего развития, цифровое месторождение.

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