

INCREASED EFFICIENCY DEVELOPMENT OF HIGH-VISCOSITY OIL FIELD AND NATURAL BITUMEN

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Abstract. In the oil industry, one of the current problems is the fascination with the efficiency of the production well. This reflects the urgency of developing an anomalous oil deposit. When developing such fields, asphalt-resin oil and highly viscous paraffin oil accumulate when the production well zone is bottomed out. This leads to the formation of a highly viscous emulsion during the bottoming of the production well zone

Keywords: oil, natural bitumen, quarry, mine, well, steam, gravity, tectonics, reserve, viscosity, liquid, physicochemical, hydrocarbon.

ПОВЫШЕННЫЕ ЭФФЕКТИВНОСТИ РАЗРАБОТКА МЕСТОРОЖДЕНИЕ ВЫСОКО ВЯЗКИ НЕФТИ И ПРИРОДНЫЙ БИТУМЫ

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Аннотация. В нефтяной промышленности один из актуальной проблемы являются увлечение эффективностью эксплуатационной скважины. Это отражает на себе актуальности разработка аномальной нефтяной залежи. При разработки таких месторождение, при забоине зоны эксплуатационной скважин накапливается асфальтосмолости нефти и парафиновой высоко вязкой нефти. Это приводит образование при забоине зоны эксплуатационной скважины высоко вязкой эмульсии.

Ключевые слова: нефть, природный битум, карьер, шахта, скважина, пар, гравитация, тектоника, запас, вязкость, жидкость, физико-химический, углеводород.

YUQORI QOVUSHQOQLI NEFT VA TABIIY BITUM KONLARINI QAZIB CHIQRISH SAMARADORLIGINI OSHIRISH

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Annotatsiya. Neft sanoatining dolzarb muammolaridan biri quduqlarni ishlatish samaradorligini oshirish hisoblanadi. U anomal neft uyumlarini ishlatishda muhim dolzarblikni oʻzida namoyon qiladi. Chunki bunday konlarda quduqlarni ishlatish neftning anomal qovushqoqligi va haratlanishini yuzaga kelishi, asfaltsmolaparafin toʻplami va qatlamning quduq tubi atrofi zonasida yuqori qovushqoq emulsiyalarni hosil boʻlishi bilan murakkablashadi.

Kalit soʻzlar: neft, tabiiy bitum, karyer, shaxta, quduq, bugʻ, gravitatsiya, tektonika, zaxira, qovushqoqlik, flyud, fizik-kimyoviy, uglevodorod.

Introduction. The problems of exploitation of natural bitumen and unconventional hydrocarbon raw materials are considered to be one of the urgent problems, mainly for countries with high industrial potential, developed infrastructure and highly qualified personnel [1].

Natural bitumens are genetically degassed to varying degrees, have lost their light fractions, are viscous, semi-solid natural oil derivatives (malts, asphalts, asphaltites) [2]. These, like bituminous rocks, are valuable multi-purpose raw materials for many industries. It is an additional source of hydrocarbon raw materials for the fuel and energy industry. It is used as an asphalt-concrete mixture in the construction industry. In metallurgical industries, it is used as a companion metal component.

According to the estimation of the United Nations, the geological resources of natural bitumen in the world are about 260 billion tons, of which the extracted resources are 70 billion tons, so about 70% of the resources are in Canada.

Literature review. Heavy oil ($\gamma = 0,98$) can be divided into three types according to the conditions of its formation in the territory of Uzbekistan: 1) according to changes in the zone of rapid hypergene-water-oil exchange; 2) paleohypergene-unchanged; 3) heavy oils accumulated at a great depth.

Heavy oils of the first group include oils that have naturally come to the surface in the hilly areas of the Fergana basin (Shorsu, Shim. Rishton, Sel-Roho, etc.) and in the upper horizons. As a result of long-term exposure of mobile waters with low mineralization in tectonic intensive zones, aerobic-microflora and other atmospheric agents caused the loss of light gasoline fraction, partial deparaffinization and loss of other non-renewable elements. Such oils (naphthides) - mortars, asphalts, asphaltites, kerites are called intermediate oils in the process of formation of bitumen in the petroleum series.

Heavy oils of the second group are distributed in the Afghan-Tajik basin, in Paleogene deposits, high-sulfur (up to 5%) low-gasoline oil, aromatic hydrocarbons (NK - 300 OS fraction on average 28%), containing up to 25% nitrogen, up to 15% carbon dioxide enriched with gases. Such oils lie in carbonate-sulphate deposits and

were formed under the influence of neotectonic movements that occurred in the Neogene-Quaternary period.

Heavy oils of the third group were found in horizons or layers at a great depth (2800 m) in different regions of Uzbekistan. These oils differ in the amount of asphaltenes, tar substances, and partially n-alkanes S15-S36 gas condensate deposits (Ortabuloq in Western Uzbekistan, Kamishladja in Turkmenistan, etc.). The high formation pressure allowed the retrograde transition of oil fractions to the gas solution, except for the gasoline-kerosene fraction. In this regard, this type of oil can be included in deep-residual oil.

In tectonic active zones, various natural bitumens in the oil line were formed as a result of the release of oil to the surface, denudation of oil layers, and the complex effects of atmospheric factors. In Uzbekistan, such bitumens are distributed in the areas adjacent to the Fergana mountain ranges, in the Surkhandarya basin and around the Zirabulok-Ziaetdin mountains [3].

Reserves of high-viscosity heavy oils and natural bitumen amount to 790 billion according to various estimates. 1 trillion per ton. up to tons, approximately 162 billion. tons of small and medium-viscous residue is 5-6 times more than recoverable oil reserves.

Exploration reserves of heavy oil and natural bitumen are few, currently, light and medium oil reserves are relatively more known [3].

The heavy oil field in the Orinoco Belt in Venezuela and the bitumen deposits in the eastern hills of the Western Canadian Basin are two of the largest in the world. The total initial reserve of oil is 3600 bln. constitutes a barrel. The reserve due to technology development is 900-1200 bln. can form a barrel.

Production of heavy oil began in the first decade of the last century in the USA, Venezuela, and Mexico, and developed rapidly in the 1940s [3].

Research Methodology. There are various methods of extraction of heavy oil and natural bitumen deposits, which differ in their technological and economic characteristics. The use of one or another technology of extraction depends on the geological structure and bedding conditions of the layer, the physical and chemical characteristics of the fluid of the layer, the state and reserves of hydrocarbon raw materials, climatic and geographical conditions, etc. based on They can be conditionally divided into different groups according to their application:

- 1 – quarry and mine method of extraction;
 - 2 – “cold” method of extraction;
 - 3 – thermal methods of extraction.
- Quarry and mining method of extraction.

Natural bitumen heaps are mined by open (quarry or mine) and underground (mine, mine-well) methods.

Hard bituminous shale can lie almost at the surface, but bituminous rocks can lie at depths of up to 750 meters (Peace River Mine, Canada), sometimes even deeper. Usually, the mining depth does not exceed 150-200 meters, in many cases mining is carried out at a lower depth.

Extraction of oil products by the pit method consists of two main operations: extraction of oil rocks underground and transportation to the refinery for extraction of oil. Mining with this method has low capital and operating costs, and after carrying out additional work on the extraction of hydrocarbons from the rocks, a high coefficient of oil recovery is provided: from 65 to 85%. Excavators, scrapers, bulldozers, and other mining techniques are used to bring rocks up.

The Athabasca bituminous sand mine in Canada (Alberta province) is the largest mine in the world. The thickness of the sands is up to 90 meters, and the depth of the sands is up to 600 meters. Sands with quartz porosity up to 30%. Bitumen saturation is from 2 to 18%, on average 8%.

Extraction by the mining method can be carried out in two different modifications: a cleaning mine (raising hydrocarbon-saturated rocks to the surface) and mine-wells (drilling vertical and inclined wells in the productive layer to process the rocks above the layer and collect oil from these processed rocks) [5, 6].

The clean-up shaft method is used only in productive layers up to 200 meters deep, this method has a much higher oil recovery coefficient (up to 45%) compared to well methods. When using this method at a great depth, the efficiency of the method decreases due to the passage of hydrocarbon-unsaturated rocks, because at present, this method is economically effective if the rocks contain rare metals in addition to hydrocarbons. The mine-well method of extraction can be applied to productive layers up to 400 meters deep, the coefficient of oil permeability is much lower than the cleaning-mine method, and a large number of wells are required to be drilled. The principle of using the mine-well method is as follows. If the mountain developments are below the oil and gas productive horizons, drainage wells are drilled in them (usually 10-12 wells are drilled), oil flows under the influence of gravity factors into a special channel prepared in advance, which is dug obliquely to the side of the oil storage area. If the mining development is above the oil and gas productive horizons, then wells are also drilled, but the oil is extracted by pumps. High-viscosity oil is transported through the canvas with the help of water in an open manner without gaseous components. After that, this oil is pumped up from the oil storage area.

In order to increase the productivity picture of final oil and natural bitumen and to ensure the complete processing of the reserve in the mine-well method of production, steam-heat effect is used in the formation. This method is called the hot-ice method, it is used up to a depth of 800 meters and has a high oil recovery coefficient (up to 50%). However, compared to mine and mine-well methods, management is more complicated. Yareg mine is an example of heavy oil piles mining.

Mining of the Yareg mine is divided into three stages:

- 1) Experimental use of wells on the surface of the earth;
- 2) Mining method of extraction;
- 3) Extraction by the mining method with the effect of heat on the layer.

The exploitation of wells on the surface of the earth led to the extraction of 2% of oil. It is for this reason that the idea of drilling mine wells appeared, ending in a gallery system in the horizons lying above.

Mining is carried out according to two systems:

1) Ukhtali, in which the piles are drained through a dense network of vertical or slightly inclined wells (up to 50 meters deep), which are drilled from the overlying tuffite horizon rock formations located 25 meters above the productive layer;

2) Inclined wells - inclined wells up to 200 meters long, located in the upper part of the formation in the form of a gallery system, are drilled hexagonally (on an area of 8-12) in the lower part of the horizon.

Such two-system wells made it possible to increase the coefficient of oil recovery up to 6%. Steam heat was used to increase oil permeability.

The efficiency of any production system is determined by economic indicators - the cost of oil production, the rates of oil recovery and oil recovery coefficient.

“Cold” methods of oil extraction

“Cold” methods of heavy oil extraction can be criticized, first of all, “CHOPS” method, this method has the possibility of producing oil along with sand due to the erosion of weakly cemented reservoir rocks and creating conditions suitable for the formation for the flow of oil and sand mixture (Lloydminster field in Canada). When using the “CHOPS” method, operating costs are low and large investments are not required, but in this case, the oil recovery coefficient does not exceed 10%. In “cold” oil extraction, pumps with special equipment are widely used (for example, a screw pump), with the help of these pumps, specially formed formation fluid and sand mixtures are withdrawn. Sand mining creates long channels (or pits) with high permeability. experiments show that some channels can escape up to 200 meters from operational wells. High-permeability channels together with foamed oil provide a high oil recovery ratio, and high productivity is observed in several oil-rich reservoirs

in the Lloydminster Cone. There are several limitations to cold mining technology's commercial viability. According to the current estimates, the oil production volume is 36,500 m³/day. (230,000 barrels/day), while the production volume is predicted to decrease by 50% in the next decade. Such a decrease in productivity is caused by the following criteria:

- lack of deposits suitable for obtaining products by the cold method;
- watering of wells due to the flow of water through the network of channels;
- reduction of layer pressure and layer energy;
- low liquid flow and high gas factor;
- due to the above reasons, there is no opportunity to use the wells for more than 7-8 years.

“VAPEX” method can be added to the ranks of the “Cold” method of extracting heavy oil and natural bitumen using solutions, according to which the solution is pumped into the layer in gravity drainage mode. According to this method, exposure to the formation using steam from horizontal wells is estimated. A solution chamber is formed from these due to driving solution above (hydrocarbon solution as well as ethane or propane). Oil is diluted due to the diffusion of solutions in it, and under the influence of gravity, it flows along the boundaries of the chambers towards the wells where the product is extracted. According to this method, the coefficient of oil recovery reaches 60%, but the rate of response is much lower.

Thus, the "cold" methods of extracting heavy oil and natural bitumen deposits have a number of disadvantages. These disadvantages include limitation of maximum oil viscosity and low production rate. Therefore, in the design of the production of heavy oil and natural bitumen fields, it should be carried out in connection with the influence of the layer by the thermal method.

Conclusion. Thus, high-viscosity oil and natural bitumen reserves are somewhat larger than traditional low- and medium-viscosity oil reserves, and difficult-to-extract crude deposits are widespread in the world.

Canada, USA, Russia, Venezuela, Nigeria and other countries are actively developing heavy oil and natural bitumen deposits.

High viscosity oil and natural bitumen should be considered as complex raw materials. High-viscosity oil and natural bitumens contain valuable heteroorganic compounds such as petroleum acid, sulfoacids, simple and complex ethers, metalloporphyrins, sensitizers, organic semiconductors, which serve as a source of unique catalysts. These components and compounds are used in biology, biotechnology, chemical technology, microelectronics, therefore, there is a high demand for these products in countries with rapid development of technology.

Development of the direction of extraction of high-viscosity oil and natural bitumen includes the following activities:

- study of foreign experience in extraction of high-viscosity oil and natural bitumen deposits;
- analysis and development of rational methods of extraction of high-viscosity oil and natural bitumen, as well as development of methods of increasing oil permeability for maximum extraction of all useful components;
- development of technology for extracting products from high-viscosity oil and bitumen in the field, and this obtained product should be compatible with the movement of main pipelines;
- development of technology aimed at increasing the scale of high-viscosity oil and natural bitumen processing and extraction of related components and creation of oil processing capacity;
- solving specific environmental problems associated with extraction, transportation and processing of high-viscosity oil and natural bitumen.

It should be noted that extraction of high-viscosity oil and natural bitumen is not considered a trend today, but it will have its place in the near future.

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