HIGH-VISCOSITY OIL AND NATURAL BITUMEN AS A SOURCE FOR INCREASING THE PRODUCTION OF LIQUID PETROLEUM PRODUCTS

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Abstract. This article provides an overview of existing deposits of high-viscosity oils and natural bitumens in the Republic of Uzbekistan. Geological exploration and development of hard-to-recover reserves using global experience and the direct implementation of innovative technologies will allow an expansion of the country's resource base and oil production volumes necessary for sustainable economic growth.

Keywords: High-viscosity oil; Natural bitumen; Hard-to-recover reserves; Unconventional hydrocarbon resources; Heavy oil deposits; Bitumen accumulations; Geological exploration; Hydrocarbon migration; Hypergenic alteration; Innovative extraction technologies; Oil and gas industry; Uzbekistan.

Due to the depletion of oil fields that are currently being intensively developed, oil and gas companies worldwide are increasingly focusing on the development of high-viscosity oil and natural bitumen deposits. While in recent years many oil companies preferred the exploration and development of conventional (light) oil fields with large concentrations of estimated reserves, in the coming years an increase in investment in existing and new projects for developing hard-to-recover reserves should be expected, primarily high-viscosity oil (HVO) and natural bitumen (NB) deposits.

Canada's role in the development of HVO and NB resources is difficult to overestimate. Natural bitumen constitutes the main share of Canada's core assets, which has resulted in extensive experience both in assessing and accounting for unconventional hydrocarbon resources and in the technologies and techniques used for their development. Canada's advanced experience demonstrates that despite increased capital investments and operating costs, higher transportation tariffs, and stricter environmental protection requirements, the global growth in energy demand, high oil prices, and innovative technologies make it economically feasible to develop bitumen deposits and significantly increase production. If production amounted to about 140 million tons in 2010, it is expected to increase to 240 million tons by 2025.

Deposits of HVO and NB are also present in the Republic of Uzbekistan. They are mainly distributed within the Bukhara-Khiva, Fergana, and Surkhandarya regions. However, this issue has not been sufficiently addressed in Uzbekistan, although research work was conducted in the 1970s–1980s by the "SredAzNIPINeft" Institute. The stratigraphic range of rocks hosting HVO and NB extends from Paleogene to Paleozoic formations. They are observed not only within designated oil and gas regions but also in the Tashkent and Samarkand regions. The largest bitumen manifestations in the Surkhandarya region include the bitumen fields of Aktau, Dasmanaga, Gamarly, Taldy-Bulak, Cognisay, Shakarlyk-Astana,

as well as high-viscosity oil fields Amudarya, Khaudag, and Korsagly. From the Fergana Basin, only small portions of bitumen manifestations extend into Uzbekistan, including Chimion, Kyzyl-Archa, Varzyk, and Shorsu II. In the Tashkent region, Paleozoic rocks contain bitumen manifestations in the Burchmulla, Chatkal, and Chavata areas. In the Zarafshan Basin, most bitumen fields are associated with the Zirabulak-Ziaetdin structures and the Nurata Mountains.

Among the listed objects, the Surkhandarya region is the most studied. To date, 14 oil fields, one oil and gas field, and one gas field have been discovered. Oil accumulations are associated mainly with Paleogene deposits. The oil is heavy, high-viscosity, sulfur-rich, resinous, and of methane-naphthene-aromatic type.

Geological and geophysical analysis identified the Korsagly-Dasmanaga zone as a priority research object. Based on reinterpretation of drilling and logging data, a new geological model of the Korsagly field was developed. The field is interpreted as a screened deposit, where the screen is presumably a bitumen plug.

Exploration drilling in the Dasmanaga area revealed fractures filled with immobile high-viscosity oil and dark brown bitumen. When heated to 100°C, the oil becomes mobile and spreads along fractures and bedding planes. A water sample taken from the oil-water contact exhibited a strong oil odor and black viscous sediment. Laboratory analysis indicates that the sediment is a product of biochemical and chemical oxidation of oil and is close in properties to asphaltites.

Numerous additional bitumen and oil manifestations have been identified in the Babatag Range, Fergana Basin, and northeastern margin of the Amu Darya syneclise. Studies indicate that bitumen accumulations formed due to multi-phase lateral and vertical migration of hydrocarbons followed by hypergenic alteration processes.

Based on core samples and surface studies, seven bitumen fields have been identified in Western Uzbekistan. To determine their industrial value, targeted geological exploration including shallow drilling and pilot quarry operations is

required. At present, the implementation of innovative technologies for HVO and NB production is a critical task for the oil and gas industry. Before initiating industrial development, deposits must be identified, explored, reserves estimated, and economic feasibility assessed. The "Action Plan for Geological Exploration, Production, and Processing of Heavy Oils and Natural Bitumens in the Republic of Uzbekistan" is timely and represents the first step toward establishing a new direction in the country's oil and gas industry.

Development of hard-to-recover reserves using global experience and innovative technologies will expand Uzbekistan's resource base and oil production volumes necessary for sustainable economic growth.

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