

PROSPECTS FOR THE USE OF FUEL SHELLS IN THE FUEL BALANCE OF UZBEKISTAN

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Abstract: This article is devoted to the prospects of using oil shale in Uzbekistan. Oil shale is one of the promising types of organic raw materials that can largely compensate, and in the future, replace oil products and gas. On the territory of the Republic of Uzbekistan, there are huge reserves of oil shale - 47 billion tons. Various types of products can be obtained from oil shale. In Uzbekistan, prerequisites are being created for the organization of the shale industry, the issue of developing an attractive investment project and attracting foreign investment to create shale processing enterprises is being considered.

Keywords: ecology, oil shale, organic raw materials, mineral raw materials, industrial processing, diversification of the fuel balance.

The constant increase in global energy consumption is depleting traditional energy resources, primarily oil and gas. Alternative ways of obtaining energy from tidal, wind, solar, geothermal and other sources are currently inferior to traditional energy. However, some countries receive a very significant share of energy from nuclear power plants [1-3]. The search for alternative sources of raw materials is especially relevant for countries and regions with a strained fuel and energy balance. One of the alternative energy sources, first of all due to huge reserves and chemical composition, is oil shale. These rocks can serve as substitutes for oil, both for energy production and for the production of various chemical products. Oil shale is one of the most common solid fuels. Specialists estimate that the explored reserves of organic carbon in the world are: in oil - 1011 tons, in coal - 1013 tons, in oil shale - 1017 tons [4]. According to data from the European Parliament, in 2017, the world's oil shale resources amounted to 11 trillion tons. Oil shale is a complex mineral - both a fuel and a chemical raw material.

They can be used as fuel for direct combustion and also as oil shale after processing; in addition to oil shale, various chemicals can be produced during thermal processing of oil shale. Both organic and mineral parts of oil shale are of industrial value, including rare and scattered elements.

Various products can be produced from oil shale:

- fuel and energy products (gas, furnace oil, diesel, fuel oil, gasoline, kerosene),
- Chemical (benzene, toluene, thiophene, sulfur, phenols, ichthyol, etc.),
- concentrates on rare and scattered elements.

Oil shale is one of the promising types of organic raw materials, which can largely compensate and, in the future, replace oil products and gas [5]. In contrast to other species, solid oil shale contains significant amounts of hydrogen in organic matter. The possibility of obtaining liquid and gaseous hydrocarbons from oil shale, which are similar in composition and properties to oil products and natural gas, allows considering them as important strategic resources [6]. At present, coal and oil shale are the most comprehensive and reliable energy sources. The problems of oil shale processing are becoming urgent and require close attention. The study of oil shale features makes it possible to consider it as an energy, chemical, a technological and mineral resource for use in various industries.

Uzbekistan has huge reserves of oil shale - 47 billion tons. The main oil shale deposits are located in the Kyzylkum desert and the Boysun mountains: Boysun (Surkhandarya region), Sangruntau (Navoi region) and Urtabulak (Bukhara region) [7]. Geological surveys in Uzbekistan have shown that the depth of oil shale is in the range of 100 to 500 m and below, with an average thickness of 0.5 to 1.0 m. In our Republic, where there are potential oil shale deposits, their use may now be economically feasible for some regions. If we take into account the volatility of prices for energy resources, it makes sense to conduct a more thorough analysis of the prospects for the involvement of this type of raw material in the national economic complex, taking into account modern trends and technologies. In the Kyzylkum basin alone, there are deposits with forecasted reserves of oil shale amounting to 24.6 billion tons. At the Boysun, Sangruntau, Aktau, Uchkir-Kulbeshkak and Urtabulak oil shale deposits, there are about 10 billion tons of oil shale. Prospective manifestations of oil shale have been identified in other parts of Uzbekistan. Uzbekistan ranks third in the world in terms of oil shale reserves, whose total geological resources are estimated at more than 700 billion tonnes.

To determine the directions of industrial use of oil shale it is necessary to have information about its chemical and mineralogical composition, the structure of an organic substance, presence of organomineral compounds, as well as about changes that the initial substance undergoes at various stages of thermal or chemical influence. The main quality indicators and technological properties that determine the practical significance of oil shale are related to the content of organic matter. They are conditioned by its origin and degree of transformation. Oil shale from different oil shale deposits differs significantly in appearance, composition and properties, see Table 1.

Table 1: The elementary composition of oil shale kerogen

Country deposit	Elementary composition,%				
	C (Carbon)	H (Hydrogen)	O (Oxygen)	N (Nitrogen)	S (Sulfur)
Sangruntau (Navoi region)	56-82	5-10	10-40	0,2-0,8	0,2-11
Boysun (Surkhandarya region)	64,5	7,7	20,3	2,3	5,2
Urtabulak (Bukhara region)	60-70	7-8	до 20	2,6	8-11

The peculiarity of oil shale is that the rich and poor layers of organic matter are famous in it. The chemical composition of organic matter includes carbon, hydrogen, oxygen, nitrogen and sulfur. Carbon is the main element that determines the heat of combustion of oil shale.

The oil shale of Uzbekistan, in addition to carbon, contains U, Mo, Au, W, Ag, Re, Cd, Se, Cu, Ni, Pb, S, including rare earth metals and platinum group metals. Oil shale is of industrial importance, primarily as energy raw material with high calorific value (up to 3300 kcal/kg) due to shale oil in the mineral matrix of oil shale in a chemically bound solid state. The basic ideology for the development of oil shale deposits adopted to date is to convert the organic component of oil shale at the place of occurrence into the liquid phase, i.e. to ensure conversion of kerogen (solid organic substance in the mineral matrix of oil shale) with the formation of shale oil in a well without extracting shale ore to the bottom surface. It is believed that this approach is beneficial for oil shale processing. However, oil shale is also a new promising mineral raw material for the chemical industry, metallurgy, medicine, agriculture and construction industry. Complex processing of oil shale to extract, in addition to hydrocarbons, rare and scattered elements, etc., is a problem of national importance, because molybdenum and vanadium can be extracted from coke after oil shale processing, and during chemical processing highly sulphuric fuel oils containing up to 4-6% of sulphur, which are used to lubricate engines; resins (8-12%), from which oil can be obtained to impregnate wood; electrode coke, mastic, etc. are produced. Research in this direction is actively continuing [8].

Uzbekistan does not yet have production capacities for processing oil shale, which is, as shown above, a raw material for oil products, gas, heat, electricity and inorganic elements (metals, salt, etc.). Available scientific developments [9] in Uzbekistan (mainly, Scientific and Research Institute of Mineral Resources of the State Committee on Geology and Mineral Resources of the Republic of Uzbekistan, Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan, Tashkent State Technical University, Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan) and world experience allow forecasting high efficiency of oil shale involvement in processing to expand the range of oil shale products at industrial enterprises. Diversification of industrial processing of oil shale is largely determined by the content of organic matter and mineral components; at any ratio, according to preliminary calculations, the creation of an industrial base for oil shale processing is expected to be very profitable. We believe that there is a need to accelerate the development and establishment of capacities in this sector.

The prerequisites for organizing the oil shale industry are being created in Uzbekistan today. The issue of developing an investment-attractive project and attracting foreign investments for the establishment of oil shale processing enterprises is currently under consideration. The project of deep processing of oil shale into high-quality hydrocarbon energy resources and mineral compounds and metals provides for pre-project research (R&D, PTER, temporary technological regulations, business plan) with the issuance of innovative technology and use of foreign investments to create a pilot industrial base, without which the future development is unrealistic and which would allow the development of technical specifications for the design of a pilot plant for complex processing of oil shale. State expertise of the deep oil shale processing project - Protocol of Intentions with the Investor - Memorandum of Understanding, and then - Investment Agreement - are necessary steps in preparation of the

investment part of the project, the purpose of which is to establish a waste-free oil shale processing enterprise.

Based on many years of research into oil shale all over the world and its practical application in various countries, it can be concluded that shale oil and gas have good prospects for use in Uzbekistan. Thus, it is possible to achieve diversification of the fuel balance in the country's energy sector, which will reduce dependence on natural gas for power generation.

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