PRODUCTION OF CRYOGEN IN OIL SHALE

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Abstract. *The article presents a technology for obtaining liquid and gaseous hydrocarbons from oil shale. The characteristics of oil shale of local origin are considered.*
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Oil shale status is recognized all over the world as an alternative to oil and gas condensate hydrocarbon resources.

Development and implementation of technology for obtaining gaseous and liquid hydrocarbons from the organic part of oil shale and obtaining on their basis chemical compounds for economic sectors and energy carriers with improved environmental and operational performance with the presence of methanol and ethanol in the composition, while simultaneously increasing the yield of gasoline of composite origin, eliminating the need to add co side of synthetic oxygenates in commercial gasoline to ensure improved environmental and performance characteristics, naturally reduce the cost of commercial gasoline products.

The oil shales of Uzbekistan are distinguished by a considerable content of the organic part. This circumstance will undoubtedly interest consumers, which stimulates the intensification of the development of technology and processing of shale raw materials to obtain energy carriers of various consistency, which positively affect the technological, economic, and overall strategic indicators of the republic.

The predicted situation of potential reserves of traditional hydrocarbon raw materials is the reason for the growing interest in alternative raw materials such as natural shale and other materials of organic origin.

Based on the results of the analytical work carried out, oil shale of local republican origin is considered as a fine mineral mixture of organic and inorganic components. The organic part is also divided into bitumen and creogen. The latter consists of polycyclic subgroups linked together by long chain alkanes and isoprenides. The inorganic part, unlike other deposits, is rich in oxides, molybdenum, nickel, cobalt and tungsten, as well as the presence in the composition of both the organic and inorganic parts of significant amounts of sulfur, nitrogen and phosphorus compounds, which can also without any obstacle pass into the composition of the resulting processing of combustible shale of the hydrocarbon part, regardless of their processing conditions. Therefore, the idea of the possibility of obtaining energy carriers of gaseous and liquid consistency by simple pyrolysis of oil shale is only superficial when it comes to qualified processing of oil shale to obtain commercial products - fuel and energy materials for a wide range of consumers. In addition, the analytical material produced by the relevant qualified services shows that simple pyrolysis thermally decomposes, in addition to the organic part of the minerals contained in the composition of the inorganic part of the raw material, and is accompanied by a pyrolysis process with a rapid release of carbon dioxide, with the content of nitrogen oxides of sulfur, which are emitted into atmosphere, which is an additional load on the atmosphere, and without this it is polluted with

emissions from industry, thermal power engineering and transport. At the same time, the technological process that ensures the qualified processing of oil shale with the production of gaseous and liquid energy carriers must maintain environmental safety, which today is one of the main parts of the republic's strategic security as a whole.

The developed technology for obtaining liquid and gaseous hydrocarbons from oil shale provides for the prevention of gases with harmful acidic properties and greenhouse effects from entering the atmosphere.

The technology represents the thermochemical destruction of the high-molecular part of organic substances, using the method and technology of compounding raw materials, creating a technological possibility of activating the catalytic properties of metal oxides that make up the inorganic part of oil shale, stimulating the catalytic destruction of molecules with partial oxidation in the presence of atmospheric oxygen and water vapor taking place in the reaction - technological zone of the reactor. At the same time, at the initial stage of the technological transformation of the organic part of oil shale, low-molecular hydrocarbons of a mixed paraffinic and olefin structure with the corresponding oxygenates are obtained. With an increase in the temperature of the reaction-technological process, mixtures of metal oxides that occur in the composition of the raw material begin to show their catalytic properties, and in the presence of atmospheric oxygen, the technological transformation of high-molecular mono and polycyclic hydrocarbons, as well as hydrocarbons of the heterocyclic structure of the oxidizing catalytic pyrolysis.

It is known that with the implementation in the Republic of Uzbekistan of international standards for combustion in internal engines “Euro-3” and “Euro-4” and “Euro-5”, a reform of the hydrocarbon composition of fuel mixtures is being carried out, which is an energy carrier - energy consumption raw material for internal combustion engines, which strictly regulates the content of aromatic hydrocarbons in the fuel mixture and completely exclude the use of ethyl fluid, which over the past 40 years has been the hegemon in the list of fuel additives used in internal combustion engines.

Instead of tetraethyl lead, oxygen-containing hydrocarbons, oxygenates, alcohols, ethers, etc., are successfully used. In the products of oxidative autocatalytic pyrolysis of oil shale, alcohols of normal and iso-structures and other chemically oxygen-containing reactive-passive substances take place in the form of raw materials. In the case of the formation of organic alcohols, the technological scheme put forward for the implementation of the technological process provides for catalytic etherification in the vapor phase of oxidative pyrolysis products. As is known, ethers also have high activity as additives that improve the environmental and performance properties of fuels. The resulting pyrocondensate, a product of oxidative autocatalytic pyrolysis, also undergoes the process of thermo-catalytic chemisorption desulfurization in an associated technological process and is sent in the form of a wide light oil fraction, together with processing with traditional hydrocarbon feedstock, to refineries. The performed analytical work stimulates the development of the above-mentioned technology, since the chemical composition of local oil shale, in contrast to not numerous objects of this kind, requires processing precisely according to such a complex multifunctional complex technology. Given that the Republic of Uzbekistan has large reserves of oil shale, the development of technology for producing synthetic fuel mixtures based on them is a sufficient promising direction. In the Republic of Uzbekistan, it is also planned to process shale from the Sangruntau deposit in the near future. It should be noted that without own developments, taking into account the specifics of the chemical composition and other local conditions, blind

copying and replication of technology is not promising, as shown by many years of practice. Therefore, the development of our own technology, taking into account the peculiarities of local conditions and the characteristics of raw materials, is a guarantee of ensuring efficient, both in technological, environmental and operational terms, which is very necessary.

In the current oil shale processing technology in Narva (Estonia), the main technological focus is on obtaining a mixture of gaseous and liquid hydrocarbons. The rest of the technological process of thermal processing of oil shale from the inorganic part - metal oxides after their destruction of carbonate structures has an admixture of carbon black of the charred part of hydrocarbon compounds. According to the available technology, the charred part and carbons remain in the composition of the inorganic part, which, in the case of processing the inorganic part, adversely affects the technological process of extracting metals from their mixture of oxides.

In the technological process of production of processing, the stages of obtaining organic materials of commercial quality are provided. In addition, in contrast to the thermal technological solution, which is aimed at obtaining an organic product by the destruction of the organic part, the present technological process provides for the development of pyrolysis of the resinous bitumino us part by gasification of the residual carbonaceous part.

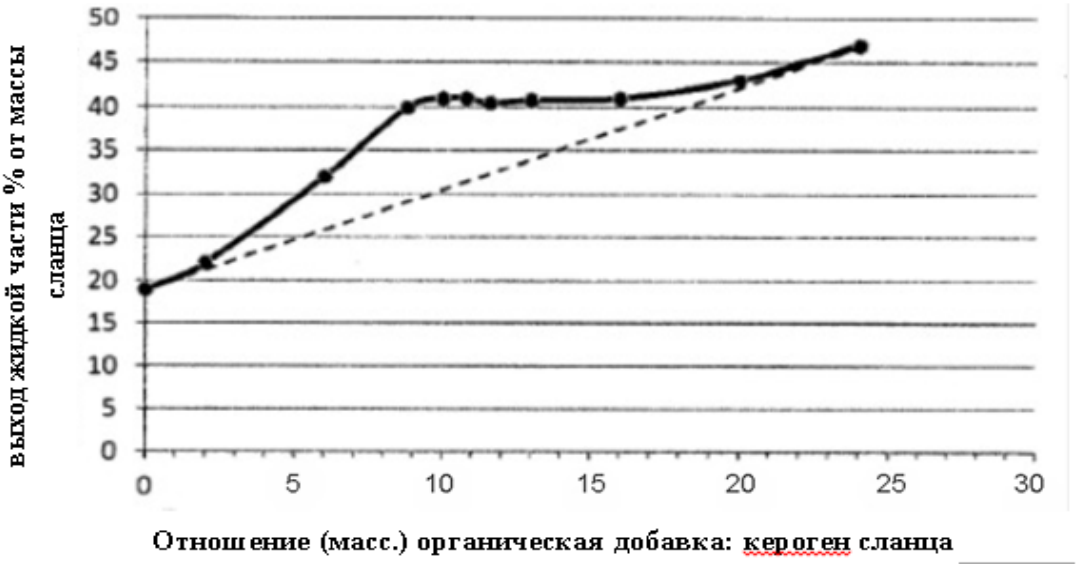

Figure 1. Effect of organic additives on tar yield during shale pyrolysis

With an increase in the content of the organic mass, the yield of the liquid part during pyrolysis will increase due to the destruction of the organic part by compounding, since during the destruction of the hydrocarbon part, ethanol and methanol containing liquid parts are formed. From other types of added organic matter, flammable liquid compounds are also released.

The practical value of the developed technology is the development of obtaining light naphtha with the presence of methanol and ethanol from a mixture of alternative and renewable raw materials, which simultaneously improves the environmental and operational characteristics of light oil and, consequently, the resulting commercial gasoline based on it, which is one of the *most urgent* problems of energy and chemical technology. Therefore, it can be confidently noted that the developed technology and the development of an environmentally safe complex-coup led technology for the processing of oil shale with the production of gaseous and liquid hydrocarbons on their basis from a compound of raw materials consisting of a mixture of oil shale with wood-bioplant material with the production of a compound fraction of light hydrocarbons with improved environmental and performance indicators is not only important, but necessary. The light naphtha

compound containing methanol and ethanol, which improves the environmental and operational performance of fuels, does not contain sulfur compounds and aromatic hydrocarbons, which is very important in the production of fuels for internal combustion engines, which will improve the environmental and operational characteristics of commercial automotive fuels. Solving at the same time the problems of environmental safety in general and as one of its important components - the issue of rational use of natural and secondary raw materials. The latter is of great ecological and economic nature due to the depletion of natural traditional reserves of oil and gas potential.

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