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Factors Affecting the Light Absorption Coefficient of Oil Produced From a Multilayer Mature Field

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Abstract: Oil is involved in the displacement process from more porous and permeable areas, and an increase indicates that areas are involved in the displacement process collectors with degraded characteristics.

Keywords: The light absorption coefficient; multihorizont field; exploitation object; simultaneously-separate extraction of oil; oil saturation

INTRODUCTION

The Aksholak multi-layer high-viscosity oil field of the Republic of Karakalpakstan has been in commercial development since 2010, it is confined to the uplift of the same name on a structural terrace that complicates the western slope of the Karakalpak dome. At present, it has entered the final stage of development, the duration of which, as you know, can be more than a dozen years, belongs to the category of "mature" deposits. The main production targets are deposits that are developed using linear in-loop waterflooding. The objects were drilled with a grid with a distance between wells of 400 m siltstones, with coal inclusions, Tournaisian deposits are represented by rather homogeneous carbonate rocks. In some wells, these layers are identified in as single-layer production facilities, in others, simultaneous separate production from these reservoirs (OSD) is carried out and the oil produced is a mixture of oil from the Tula horizon and the Tournaisian stage. The viscosity of oil in reservoir conditions is several tens, and that of degassed oil is several hundred mPa s [1].

The work methodology included sampling and preparation of samples, laboratory studies of light absorption coefficients Ksp of oil solutions in organic solvents, correlation of laboratory and geological field data. Sample preparation consisted in their thorough dehydration by various methods [2]. During the secondary dehydration, residual water was removed from the samples by centrifugation, and the quality of the secondary dehydration was checked using a polarizing microscope. Studies of the optical density and light transmission and light absorption coefficients of oil solutions in organic solvents were carried out using photometers, a KFK-3 photoelectric photometer (400–900 nm) and a UNICO photocolorimeter (320–1020 nm), which differ in the wavelength of the emitted monochromatic radiation, methods for setting the required wavelength and visualization measurement results [3]. It was found that the CSP of the produced oil depends on complex, both geological and technological factors. The identification of these facts ditch and the study of the degree of their influence on the CSP of the produced oil is the subject of this work. For oil as wells in which the Tula and Tournaisian formations are identified as bridge objects, and wells in which they are conducted simultaneously - separate operation, with an increase in the elevations of the reservoirs, the value of Ksp oil you increase. With an increase in the occurrence marks of the Tournaisian stage, they increase Xia values of Ksp produced Tournaisian oil, which is illustrated by a comparison Ksp of oil at 400 nm and marks of the top of the Tournaisian stage.

Thus, for oil in more submerged sections of the reservoir are characterized by higher values of CSP for oil. This is due to the fact that oil in the domed elevated part of the reservoir is characterized by a higher content reduction of light hydrocarbon fractions and a lower relative content asphalt-resinous fraction (due to the greater distance from the pure aquifer parts of the layer). These patterns are violated, however, under the influence of filtration ny processes in the development of layers. For example, in wells on the structure dome oil can flow from the water-oil more submerged part of the reservoir, characteristic increased values of Ksp.

The CSP of oil was compared with other geological and field characteristics, both oil itself

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(density) and reservoirs (porosity coefficients, oil saturation and permeability), and well performance indicators (accumulated additional bullish). The results of these studies are summarized in the table. With increasing density.

The CSP of oil increases, which was confirmed both for the Tula and Tournaisian formations, as well as and for wells in which they are simultaneously-separate operation (ORD). This is due to the fact that oils with a higher density are characterized by a higher concentration tration of asphalt-resinous substances [5]. Properties of terrigenous reservoirs – clay density, permeability and porosity also affect the physicochemical properties of the pumped oil. With an increase in porosity and oil saturation, the values of Ksp are extracted mine oil decreases, and with an increase in clay content, they increase.

From reservoirs with degraded capacitive filtration characteristics - reduced values of open porosity and permeability, increased values of clay content, oil is produced with a high content of asphaltic and resinous hydrocarbons and, therefore, with increased values of the light absorption coefficient (Ksp). This is due to the fact that in the process of migration and accumulation, adsorption of high-molecular-weight asphalt-resinous oil components occurs on the walls of pore channels, the diameter of which is much smaller, equal to or slightly different from the double thickness of the adsorption-solvation layer. As a result, light hydrocarbons are displaced into reservoirs with improved capacitive-filtration properties.

Characteristics. So in reservoirs with increased porosity and permeability 38 Oil and Gas No 6, 2016 oil is initially distinguished by low density, low content of macromolecular compounds in it, and, accordingly, low values of the light absorption coefficient. Such reservoirs are distinguished by a rather large diameter of pore channels, in the central part of which and light hydrocarbons are preserved, and towards the walls of the pores their density increases, since the content of tar-asphaltene hydrocarbons increases in them. In the process of reservoir development, the lightest oil from reservoirs with the best capacitive and filtration characteristics rushes into the production well, that is, the lightest oil component is displaced, which is not part of the adsorption-solvate layer and is characterized by a lower content of macromolecular substances and, accordingly, lower values coefficient of light absorption. A number of works [9, 10] are devoted to the study of the relationship between the cumulative production and the light absorption coefficient (Ksp).

With an increase in cumulative production, the values of Ksp, both for Tula and Tournaisian oil, increase, but for wells in which simultaneous-separate the exploitation of reservoirs with an increase in cumulative production, the values of Ksp of produced oil decrease. There are 3 groups of factors according to the degree of influence on CSPproduced oil:

- highest influence - hypsometric position of the reservoir, oil density, cumulative production; medium influence - formation clay content
- Least influence - porosity, oil saturation and reservoir permeability.

The study of the dependences (see Table) allows us to draw conclusions about the nature of the development of seams [11–13].

Thus, a decrease in the Ksp of oil in wells in which the exploratory survey is carried out from the Tula and Tournaisian reservoirs, with an increase in cumulative production, may indicate that a reservoir is put into operation in them (during the organization of the exploratory survey system), which is characterized by lower values of the reservoir. Correspondence to the increased values of porosity and oil saturation of the Tula reservoir with lower values of Ksp of the produced oil indicates the continued development of reservoir sections with the most favorable capacitive-filtration characteristics. An increase in the Csp of oil in wells in which pressure-spreading operations are carried out from the Tula and Tournaisian formations with an increase in porosity, oil saturation and permeability of rocks indicates that oil is pulled into wells with pressure-spreading operations from the lower water-oil zones of the Tournaisian reservoir, while in the Tula reservoir, apparently , areas with the most favorable capacitive-filtration characteristics are developed. As heavier oil from areas with degraded characteristics is involved in the development, the Ksp of the produced oil increases. Therefore, a decrease in the CSP of oil in the process of development.

The bottom line indicates that oil is involved in the displacement process from more porous and permeable areas, and an increase

indicates that areas are involved in the displacement process collectors with degraded characteristics.

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