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FEATURES OF FILTRATION CAPACITANCE PROPERTIES OF COMPLEXLY CONSTRUCTED PRODUCTIVE JURASSIC TERRIGENOUS RESERVOIRS OF THE USTYURT OIL AND GAS REGION

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Abstract: *Based on geological and technological factors, it is necessary to take into account the gas extraction coefficient when calculating reserves for gas and gas condensate fields. The increase in gas reserves should be drained only by recoverable reserves, which most realistically reflect the availability of resources for the oil and gas industry. The purpose of the work. Analysis of the dynamics of the development of the Surgil, East deposits. Berdakh-Uchsay, Urga with the whole determination of the final volume of drained gas reserves, the assessment of the gas recovery coefficient and the development of a recommendation on the methodology for determining the gas recovery coefficient at the fields, with surocheins to the Jurassic erogenous deposits. The gas extraction coefficient estimated according to the data of the Ustyurt field development now is clearly underestimated in comparison with the well-known ones according to literary sources for sand-clay reservoirs.*

Therefore, it becomes an urgent task to estimate the maximum possible volume of gas extraction and estimate the gas recovery coefficient. The magnitude of the gas output of *productive erogenous reservoirs developed in the natural mode significantly depends on: the reliability of determining the initial hydrocarbon reserves, the efficiency of the selected development system; lithological features of the reservoir structure; the uniformity of the structure of the reservoir pore space in terms of deposit area and section; the consistency of reservoir layers in terms of power and the uniformity of their interlayers in terms of FEZ. According to these factors, the acamu changes the final gas output of the deposits.*

The criterion in this case was the data of the reserves assessment using the pressure drop method, showing how much of the initial reserves is involved in drainage and how it changes during operation. The results of the work and conclusions. The extracted gas coefficient, being a purely economic concept, will be determined either by the results of hydrodynamic studies or empirically by the results of the development of deposits similar to the one being studied. A certain amount of gas due to the heterogeneity of the filtration and reservoir properties of the reservoirs remains in their small pores or depends on technological factors associated with a drop in reservoir pressure to a critical level-further development of the deposit becomes unprofitable. Thus, the coefficient of extraction of gas deposits in various conditions associated with either a geological or technological factor becomes lower than one.

Keywords: *gas extraction coefficient, gas-condensate, gas-oil fields, filtration and reservoir properties of reservoirs, Jurassic system, stratigraphy of the Aral-Ustyurt region, capacity distribution, productive bundle.*

INTRODUCTION. The experience of operating gas, gas condensate, oil and gas and gas-oil fields, especially in the gas mode, shows that it is necessary to improve the system of accounting for the gas recovery coefficient, including when preparing documents on various gas balances. This is due to the fact that a certain amount of gas deposits due to the heterogeneity of the filtration and reservoir properties of the collectors remains in their small pores or depends on technological factors associated with a drop in reservoir pressure to a critical level-further development of the deposit becomes unprofitable. Currently, there are at least 3 large gas condensate fields in the Ustyurt oil and gas region (UNGR), Urga, Surgil, Vostochny Berdakh Uchsay, which have been under development for various times. The gas deposits in all the deposits are of the formation type and are confined to the Jurassic sandstone bundles, whose filtration-capacity properties (FES) are low, and the sandstones are characterized by poor sorting and high clay content.

The purpose of the work. The experience of developing the Urga deposits has shown that the actual drained volume at this field does not exceed the geological reserve in categories C1 and C2 in this regard, there are 3 possibilities:

- errors in the calculation associated with an unreliable geological model
- errors in the development technology, as a result of which part of the geological reserves was excluded from the development process
- the influence of filtration and capacitance properties of the host reservoir rocks on the extraction process (gas pinching in small rocks, gas dissolution in plantar and legal waters, etc.).

In addition to the first position, the other two determine the conditions for extracting the maximum possible amount of gas from the reservoir. Currently, the gas recovery coefficient estimated according to the Ustyurt field development data is clearly underestimated in comparison with the known literature sources for sand-clay reservoirs (0.66-0.8) [1]. In all oil and gas-bearing regions of the Republic of Uzbekistan, erogenous reservoirs have an average gas output of 0.6-0.85, which is in good agreement with the data known from the literature [1, 2, 4, 8].

MATERIAL AND METHODS. The Jurassic deposits of the Ustyurt oil and gas region are characterized by the presence of all departments of the Jurassic system. The sediments of the

Lower Jurassic section with a sharp angular and stratigraphic discrepancy lie on the eroded surface of the Rhet-Leiassic and Pre-Permian rocks of the Paleozoic. In the composition of the continental Lower Jurassic formations, the parageneses of subaqueous rocks of terrestrial origin are quite clearly distinguished-mainly the accumulation of temporary channels, rivers and permanent reservoirs (lakes, swamps).

They are composed of dark gray and greenish-gray sandstones, coarse, medium and fine-grained, with interlayers of clays, siltstones, compacted, with the inclusion of charred plant remains, in places with interlayers of gravelites and fine pebble conglomerates, lenses and coal layers up to 2-5 cm thick. The Lower Jurassic deposits were formed in depressions of the pre-Jurassic relief between separate protruding blocks. On the western side of the Sudochy trough, the thickness of the lower Jurassic increases to 170-290m due to the appearance of new bundles of sand-siltstone and mudstone rocks formed in the conditions of channel and floodplain facies. In this type of section, the proportion of siltstone and clay rocks increases to 30-50%.

The maximum capacities of the Lower Jurassic deposits are noted in the Sudoch deflection and on the Takhtakair shaft. Here, at the base of the Lower Jurassic, horizons of mainly pelitic and fine-grained rocks (fine-grained sandstones, siltstones, mudstones) appear of gray-colored, rarely variegated color, enriched with inclusions of carboniferous plant residues, iron hydroxides and pyrite, horizontally layered. Probably, these are accumulations of meandering riverbeds, laced floodplains turned into ancient lakes (A.E. Abetov., L.I. Labutina. 1999). Based on palynological definitions, they are dated to the undifferentiated rat-leyas. On the areas of the Sudochy deflection, the capacity values vary from 728 to 890-950 m (respectively, the Berdakh and Sev areas). Aral and Sev. Urga). The geochemical conditions of sedimentation and diagenesis of the Lower Jurassic sediments varied from oxidative, weakly oxidative to weakly regenerative, characteristic of clay formations of deflections. The restorative geochemical situation of accumulation and transformation of sediments into rock, together with the S buried in it, existed in the most submerged parts of the deflections, including Sudochem [2, 3].

In the column of the Lower Jurassic deposits there are clay rocks estimated by Avazkhodzhaev H. H., Labutina L. I. (1980) as low-quality oil and gas-mother rocks. They usually make up 3-10, less often 25% of the total power of the Lower Jurassic. Thus, in the context of the Lower Jurassic, there are only low-power layers of oil and gas-producing rocks with low realized genetic potential of productivity. The absence of an oil-source formation in the Lower Jurassic formations excludes the possibility of the formation of syngenetic accumulations of oil and gas in them. A.M. Akramhodzhaev., Kh. Avazhodzhaev., A.E. Abetov., A.V. Kirshin., L.I. Labutina. believe that the deposits of oil, gas and condensate located in the Lower Jurassic deposits are secondary, associated with oil and gas-producing formations of Paleozoic age.

The Middle Jurassic sediments overlap the Lower Jurassic horizons without visible stratigraphic and angular inconsistency. Based on the spore-pollen definitions, Aalen-Bajos and Bath deposits are present in the section. The Kellovian formations, which were part of the Upper Jurassic division according to the previous stratigraphic scheme, are described below, together with the Oxford rocks, as part of the Kellovey-Oxford complex.

With the beginning of the Middle Jurassic epoch, a gradual differentiated deflection of the territory under consideration coincides, with the consistent involvement of more and more new areas in the area of sedimentation. In Aalen-bayos, a terrigenous series of rocks containing thin layers of bleak, inclusions of siderite and pyrite has accumulated on an accumulative alluvial plain in the conditions of a widely developed river system, with a network of branches, floodplains, oxbow lakes and lakes. Continental sedimentation was interrupted at the end of the Bajocian Century by a major transgression, marked by the accumulation of coastal-marine and shallow-sea formations with stratification of the type of small ripples, feathery and horizontal. The presence of syngenetic glauconite was recorded in the rocks of the upper part of the Bayos [5].

The maximum capacities of the Middle Jurassic formations noted on the areas of the Sudochy deflection and the Takhtakair shaft. So, in the section of the Sev well. Aral No. 1 it is 820 m, square No. 1 Kabanbai-839 m, square. No. 1P Berdakh-955m, sle. Sev.Usga No. 1 – 964 m. Geochemical conditions of sedimentation in the Aalen-Bayos age varied from weakly oxidative to weakly restorative, in the Bath Age mainly reducing ones were preserved. Attention is drawn to the richness of rocks: concentrated organic matter (COV) (veins, layers 2-6 cm thick, lenses, small inclusions of coal, carbonified remnants of stems and leaves) and scattered organic matter (MOAT). Organic matter being expressed by gelified, fusenized, lipoid and algal micro-components, the ratios of which do not remain constant in the section and on the area (Avazkhodzhaev Kh., 1975). In the composition of organic matter (s), humus substance prevails, sometimes with an admixture of sapropel.

The lower part of the Aalen-Bayos section is characterized by the presence of humus substance accumulated in alluvial-proluvial, river, and less often swamp conditions. Relative enrichment is noted up along the section (up to 5-30% insoluble residue organic matter (NOO) in the most submerged areas) S are sapropelic components, the accumulation of which is associated with lake-marsh, coastal-marine and marine facies. Relatively high concentrations of OM (0.56-11.96% and even 30-40%) were recorded in samples of carbonaceous clays.

The bituminous content of the Middle Jurassic deposits of the Middle Jurassic deposits is 0.05-0.089% per rock. The composition of bitumoids is dominated by chloroform bitumoid analysis (CBA). There are few or no humic acids at all. The bitumoid coefficient varies from 1.2-11.67% (Abetov A. E. et al., 2000). There is a tendency to increase the number of CBA and S in the direction from uplifts to dives of the Middle Jurassic era. The organic matter of the Middle Jurassic rocks is at the stage of catagenesis from MK2 to MK4. Throughout the entire territory of Eastern Ustyurt, the Jurassic oil and gas mother rocks have realized their potential. The maximum capacities (over 200 m) of oil and gas-producing rocks of the Middle Jurassic are fixed in the Kabanbai-Sudochy trough.

Analysis of the distribution of hydrocarbon (HC) emigration densities from the Middle Jurassic strata allowed Akramhodzhaev A.M., Avazhodzhaev A. A. and Labutina L. I. (1980) to formulate a conclusion about the possibility of finding syngenetic industrial accumulations of hydrocarbon gas in these deposits. This conclusion does not apply to liquid hydrocarbons, since there was no noticeable emigration of them in most of the territory under consideration. And this is despite the fact that the study of Labutina L. I. (1972) the Batsky sediments revealed in some cases the presence of sapropel-humus or, more rarely, humus-sapropel nature in them. The Middle Jurassic formations are recognized as the main generator of mainly gaseous hydrocarbons in the Mesozoic section of Ustyurt [10].

The Upper Jurassic sediments almost everywhere occur on the formations of the Batsky tier without visible angular and stratigraphic disagreement. Based on paleontological definitions of the remains of foraminifera, pelecypods, rare ammonites and brachiopods, spore-pollen complexes, marine rocks of the Kelloway-Oxford and Kimmeridge-Teton are present in the Upper Jurassic sediments. In the Kellovey-Oxford centuries, marine sedimentation conditions existed in most of the territory under consideration. Judging by the distribution of capacities, delta sediments accumulated in the Sudochy trough along with shallow-sea sediments.

At the turn of the Oxford-Kimeridge, ascending movements appeared on the territory of the Sudoch deflection, as a result of which the Kimeridge deposits were eroded in many places or were not deposited initially, and the upper part of the Kelloway-Oxford strata was exposed to hypergenic processes.

The analysis of the distribution of capacities of the Upper Jurassic accumulations revealed that the zones with the maximum values of capacities are confined to the Sudoch deflection (431-534 m). The study of the catagenetic transformation of the rocks showed that in the zones where the most favorable thermobaric conditions were provided (Sudochy, Barsakelmessky deflections), the transformation of the MOAT reached the gradations of mesocatagenesis (MK2-MK3). The analysis of the lithological and geochemical features of the rocks and the chemical and bituminological characteristics of the MOAT contained in them indicates that the main generator of gas, condensate and, to a much lesser extent, liquid hydrocarbons was the Middle Jurassic terrigenous strata. The Lower and Upper Jurassic sediments, which have a relatively low productivity potential, can be receptacles of secondary accumulations of hydrocarbons.

The Jurassic sediments, which are widely developed in the Aral-Ustyurt region, are a layer of sedimentary formations that have accumulated in a wide range of facies environments – from typical continental to normal marine. The Lower Jurassic sediments composing the basal horizons of the Jurassic section have a particularly whimsical system of changing any parameter (power distribution, consistency of the lithological composition of most horizons, changes in the reservoir properties of rocks, etc.). They are expressed by a continental series of sediments, represented mainly by alluvial and lake-marsh facies types of sediments.

Although by the beginning of the Jurassic period the relief of the Upper Permian surface was largely leveled, the studied territory was not completely peneplenized. It was a dismembered plain, complicated by individual Paleozoic remains. Already in the Early Jurassic era, there were relatively bent areas (Sudochy, Barsakelmessky bends), delimited by extensive denudation uplifts, which served as local suppliers of terrigenous material in the early Jurassic. In the Early Jurassic era, in the context of the steady expansion of the sedimentation basin, in the most bent places of the paleolandscape, there was an accumulation of fine-clastic terrigenous and clay material that formed the thickness of gray-colored and variegated rocks of the rat-leyas.

The reservoir properties of permeable rocks as a whole are very unstable, there are no clearly defined patterns in their change in the area and in the section. Several productive horizons (from bottom to top) are distinguished in the erogenous thickness of the Jurassic age of the Aral-Ustyurt syneclise: in the Lower Jurassic section of the section there is the Kuanysh horizon, in the Middle Jurassic – Oxfordian – Kokchalak, Akchalak, Alambek and Urginsky, in the Kimeridzh-Titon – Shakhpakhtinsky.

In the Sudochy trough*, the* Kuanysh *productive horizon* is distinguished at the base of leyasa. It lies inconsistently on the blurred surface of Paleozoic rocks, performing the irregularities of the pre-Jurassic relief. According to the stratigraphic range, it corresponds to the Lower Jurassic. It is characterized by the lack of retention of porous-permeable interlayers (sandstones and siltstones), lenticular character of their distribution, frequent lateral substitutions of some types of terrigenous rocks by others. In the composition of the Kuanysh horizon, two bundles of rocks are distinguished: the lower (Kn-2), composing the basal layers of the Lower Jurassic section, and the upper (Kn-1), lying in the roof of the horizon.

The lower pack is represented by gray mixed-grained polymictic sandstones with lenticular layers of gravelites, rare layers of siltstones and black carbonaceous mudstones. The rocks are strongly compacted, partially metamorphosed, cemented with clay cement. The latter contains hydrosludes, sericite, chlorite and siliceous-quartz substance, less often kaolinite. The power of the Kn-2 pack is about 150 m. *The upper pack* (Kn-1) is composed of black and dark gray mudstones and clays with rare repaired layers of siltstones and fine-grained sandstones.

The power of the upper pack is about 100m. This bundle implements the functions of a tire for the gas condensate deposit of the Kuanysh horizon [11].

The Kuanyshsky horizon is industrially productive at the Berdakh deposit. When drilling SLE. No. 1P Aral in the interval 4012-4017 (J1), gas manifestations were observed. The nature of the filtration-capacitance properties of rocks indicates the development of reservoirs of classes IV and V in the section of the Kuanysh horizon. According to Akhmedov P. U., class V collectors with degraded FEZ are developed in the Sudochy deflection. The open porosity of the rocks here is 0.8-7.9%, the permeability is practically absent.

In general, the thicknesses of the Kunyshsky horizon, as well as the effective thicknesses of reservoirs, do not remain constant even within the same area. In accordance with this, the FEZ rocks of the Kuanysh horizon also differ in a significant range of their possible values.

The Middle Jurassic deposits, including the accumulations of Aalen-Bayos and Bath, are composed of a terrigenous complex of rocks (sandstones, siltstones, clays and mudstones), characterized in its lower part by increased carbon saturation. The interlayers of carbonaceous clays reach thicknesses up to 0.5-2.0 m. The rocks have a thin-layered, obliquely layered, lenticular, massive texture. In the upper part of the bayos and in Bath, the amount of sandy material is noticeably increasing. Individual lenses and sandstone interlayers are localized in the upper part of the Aalen, where they form a group of the Kokchalak fishing horizon. It consists of two or three packs. The lowest of them stands out only in the sections of the Sudoch deflection and on the Takhtakair shaft. Their thicknesses vary from 40 to 60 m.

The reservoirs of the horizon are expressed by polymictic sandstones, from fine to coarse-grained, poorly rounded. The upper bundles have a power in the range of 20-60m. Lenticular and obliquely layered sandstones abound with carboniferous plant remains, inclusions of siderite and pyrite. The porosity of rocks is 5.5-16%, the permeability is 3x103mkm2, the density is 2.32-2.5 g/cm3 (Abetov A. E. et al., 1999). The capacity in the Sudochy deflection is 170-238 m (Solopov G. S. et al., 1996). The open porosity of sandstones is 8-22. 9 % (according to GIS data). The Alambek horizon is industrially gas-bearing in Urga.

The Urginsky horizon, according to the nomenclature of Alekseev V. P. (1994), includes three bundles composed of greenish-gray and variegated mudstones, stratified layers of sandstones and siltstones, less often limestones. Sandstones and siltstones are polymictic, sorted, relatively well rounded. The presence of pyrite and glauconite was noted in the rocks, and iron hydroxides were found in the roof part. The capacities of the Urginsky horizon vary from 200 to 400 m. Reservoirs of the Urginsky horizon are characterized, as a rule, by noticeably variable porosity and permeability.

According to the laboratory study of the core and GIS materials, the porosity coefficient varies in the range of 8-28%, the permeability is 1-196x10-3mkm2. The tires of the Alambek and Urginsky horizons located in the Kelloway-Oxford deposits are more sustained in section and area, compared with the tires of the underlying productive horizons. Their capacities vary within 20-40m. They are expressed by finely crushed clays, usually devoid of admixture of terrigenous material, and are practically impermeable (Abetov A. E., Labutina L. I., 2000).

Industrial gas inflows with condensate at the Urga field were obtained from the reservoirs of the Urginsky horizon. Gas occurrence of non-industrial value (Qg = 5 thousand m3/day) was recorded from the Upper Jurassic reservoirs of well No.2 Aral Sea (interval 2720-2708m).

The Shakhpakhta horizon is confined to the roof of the Jurassic sediments-the Kimeridgtitonian tier. It is represented by a light gray pack of carbonate rocks (limestones, dolomites), stratified by layers of sandstones and clays. It contains inclusions of anhydrites, phosphorites, glauconite, as well as remnants of microfauna of the Late Jurassic appearance. The thickness of the horizon varies significantly (from 10 to 100 m). The maximum thicknesses fall on the submerged zones of the South Ustyurt depression and on the Sudochy deflection.

The reservoirs of the horizon (limestones and sandstones) have an increased porosity (15-25%), compared with the reservoirs of other horizons, their permeability is 14x10-3 microns 2. The Shakhpakhta horizon and the Jurassic sediments as a whole are overlapped by a regionally pronounced reliable fluid barrier composed of a thickness of marine finely crushed clay rocks of the Valanginsky tier.

RESULTS AND DISCUSSION. For the territory under consideration in the Jurassic period, five stages of development are clearly distinguished, differing in paleogeographic and geodynamic features: Early Jurassic, Aalen-Bajocian, Bath, Calloway-Oxford and Tithonian (for Southern Ustyurt, Kimeridge-Tithonian). Distribution of capacities of the Lower Jurassic sediments. By the beginning of the early Jurassic, most of the Karakalpak part of Ustyurt was the scene of continental sedimentation. There are no Lower Jurassic deposits on tectonically elevated areas (the Aktumsum ledge, the Karabaut, Shordzhin, Aibugir uplifts, the right bank of the Amu Darya River). The zone of continental sedimentation was a weakly hilly accumulative plain, in the contour of which the Lower Jurassic formations with angular disagreement lie on the blurred surface of rocks of different ages: Lower Triassic, Upper Permian and Pre-Permian Paleozoic.

Almost everywhere, the Lower Jurassic deposits are expressed by a terrigenous complex (sandstones, less often siltstones and clays), bearing traces of obvious coarsening of the clastic material near the sources of demolition (the Kazakhstan-Kyzylkum land, the Central Karakum arch and the above-mentioned local suppliers of detrital material). The proportion of clastic rocks (sandstones, coarse-grained siltstones, gravelites, small-pebble conglomerates) in the column of Lower Jurassic deposits reaches a maximum in the zones bordering the protrusions of the pre-Jurassic complex. As for the capacities of the Lower Jurassic formations, they vary in a fairly wide range in the region as a whole. The highest capacity values were recorded in the sections of wells on the areas of Sudochy deflection (Berdakh sq.1P – 728 m, sq. 2 – 778 m, Northern Aral sq.1 – 888 m, Northern Urga sq.1 – 950 m) and Takhtakairsky shaft (Arka-Kungrad sq.1 – 1206 m).

In the northern part of the Sudochy trough, according to the sesmostratigraphic analysis performed by Abetov A. E., the thickness of the lower Jurassic in the contour of individual depressions is assumed to be equal to 1400 m. Such high values of capacities correspond to the foci of maximum deflections that appeared during the accumulation of the gray-colored stratum of the rat-leyas, i.e. the formation of powerful rock thicknesses is timed to the inherited deflections. It is noteworthy that fine-grained and pelitic accumulations dominate in the sections of the rat-Leyas of the Sudochy trough and the Takhtakair shaft, the share of which in the spectrum of rocks reaches 70-75%.

It is characteristic that the regional structure of the Ustyurt region is quite clearly traced in the placement of the isopachites of the Lower Jurassic – the basal horizon of the Mesozoic section. Thus, tectonically elevated areas (Aktumsumsky, Koskalinsky) are outlined by minimal (up to 100 m) isopachites of the Lower Jurassic, and the inner parts of the deflections, including the Sudochy deflection – are outlined by isopachites up to 1000-1200 m.

Distribution of the capacities of the Middle Jurassic sediments. The beginning of the Aalen Age is associated with a significant expansion of the boundaries of the sedimentation basin, which includes sandy-clay facies with plant remains that correspond to lake-marsh and alluvial-lake conditions. Just as in the Bukhara-Khiva region, layers of rocks of marine genesis appear in the Jurassic section of the Ustyurt in the upper part of the Bayos layer, marking the traces of short-term periodic ingressions of the sea. The degree of seainess increases in the roof of the Middle Jurassic, and the deposits of the Bajocian and Kellovian tiers are already expressed mainly by marine formations. The capacities of the Middle Jurassic deposits are much higher than those for the Lower Jurassic complex.

According to the nature of the power distribution, raised areas and deflection zones are clearly outlined. The maximum capacities are fixed in the central parts of the deflections, the minimum-in the zones of elevations. So, on the area of the Sudochy deflection, the thicknesses of the middle Jurassic are maximum (from 850-950 m on the sides of the deflection to 1100-1200 m in the most submerged part). At the Berdakh stage, the values of the Middle Jurassic thicknesses decrease slightly, ranging from 851 to 952 m (respectively, Northern Berdakh, sle. 1 and Berdakh, sle.2). In the Northern and North-Eastern sides of the thickness of the middle Jurassic savings remain of the same order as in Berdasco stage varying from 803 (long SLE.1 op) to 964м (North of Urga, SLE.1).

It must be emphasized that the maximum power of the middle Jurassic deposits recognized by the overwhelming majority of researchers, the main generator of hydrocarbons in the Mesozoic thicker the Ustyurt region, is in the territory Suocero deflection and Takhtakaracha shaft.

Distribution of the capacities of the Upper Jurassic deposits. In the Late Jurassic epoch, a general, but rather differentiated deflection continues, which ensured the accumulation of significant thicknesses (up to 500-600 m) of coastal-marine and shallow-marine genesis. As part of the Upper Jurassic department, the deposits of the Kellovian stage are also considered, forming a genetically homogeneous bundle with the Oxford rocks overlapping them.

The range of changes in the capacities of the Upper Jurassic deposits is not as wide as for the Middle Jurassic, and is equal to 150-620m-720m. The patterns in the distribution of Upper Jurassic sediments remain generally similar to those marked below for Middle Jurassic rocks. The foci of maximum deflections fall on the inherited deflecting zones of the Sudochy deflection and the Takhtakair shaft. In the northern part of the Sudochy deflection, a deflection zone of the north-western strike, close to the oval, outlined by an isopahita of 500 m, looms. On the areas inside this zone, the thickness of the Upper Jurassic varies from 508m to 536m (respectively Berdakh, sle. 1P, sle.4; Kabanbai sq. 1 op) [4, 12].

According to Zorina O. A., Akimenko L. M., etc. Within the Sudochy deflection, 11 (J3), 11 (J2), 6 (J1) sandstone bundles separated by clay tires are distinguished, respectively, in the sections of the Upper, middle and Lower Jurassic. Sandstone bundles differ in area and section by the distribution of reservoir capacities, the lack of restraint of the lithological composition (changes in the degree of granularity and clay content of rocks, changes in FEZ, etc.) [8].

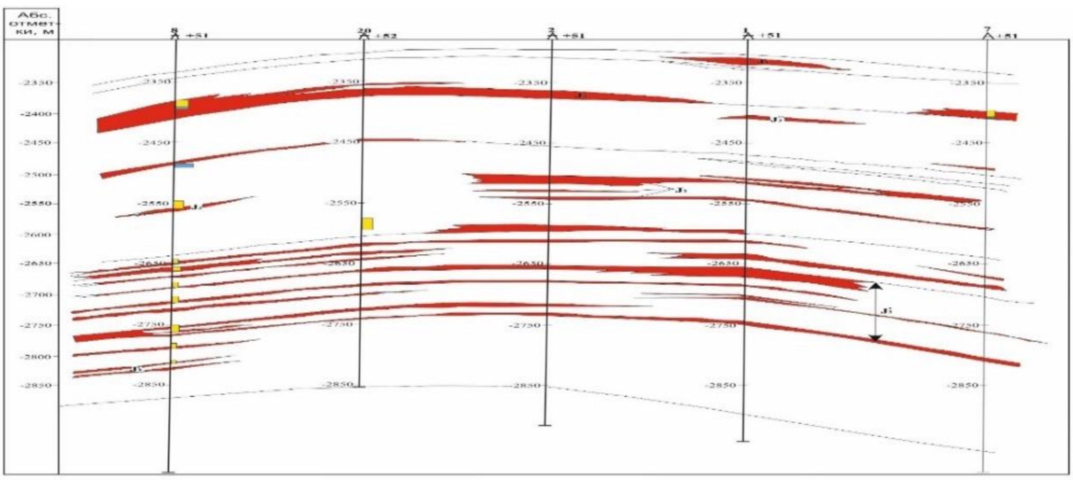

Fig. 1. Urga deposit geological section of the Upper Jurassic strata along the line of wells No. 8-20-2-1-7 (Composed by: O. A. Zorina, L. I. Nesterova).

The Lower Jurassic deposits have the greatest variability. The sandstone bundles in the Middle Jurassic and in the lower reaches of the Upper Jurassic are more mature. Fig. 1, 2, presents geological sections of the productive strata taken from the work on the deposits of Urga, East.Berdakh-Uchsay [3, 5, 13, 14]. As can be seen from these sections, despite the fact that sandstone bundles are distinguished at all deposits, reservoirs within the selected bundles are not widespread everywhere, but form lenticular bodies of various lengths.

In order to unify all the packs, the authors adopted a scheme for their indexing according to the data of Zorina O. A., based on the fact that this scheme is for the Surgil-Sev deposits. Aral, East. Berdakh-Uchsay was adopted when calculating gas reserves for these fields, and the bundles of collectors for the Urga field were "tied" to this scheme on the basis of correlation. In general, the correlation results show that the majority of bundles can be traced within the entire Sudochny deflection [16, 17].

To assess the degree of variability of the FES of the reservoirs of the selected bundles, a comparison of the average values of effective thicknesses, porosity coefficients, gas saturation and residual water saturation for the above-mentioned deposits was carried out (Table 1). For formations in which no deposits were detected, the values of Kov were determined by the equation:

$$К_{ов} = 1 - К_{г\ ср} \quad 1$$

where: $K_{g\ cp}$ is a fictitious gas saturation value calculated in a formal way from the measured values of the $\rho_п^{БК}$ and the calculated $\rho_{в\ п}$ at a given porosity. As the comparison of these parameters has shown, the reservoirs at all three fields have similar FEZ. There is a slight increase in $К_{ов}$ in the sand layers-reservoirs of the East deposits. Berdakh-Uchsay. However, in general, all collectors according to the FES can be assigned to the same group and, therefore, gas extraction processes should proceed in the same way in them.

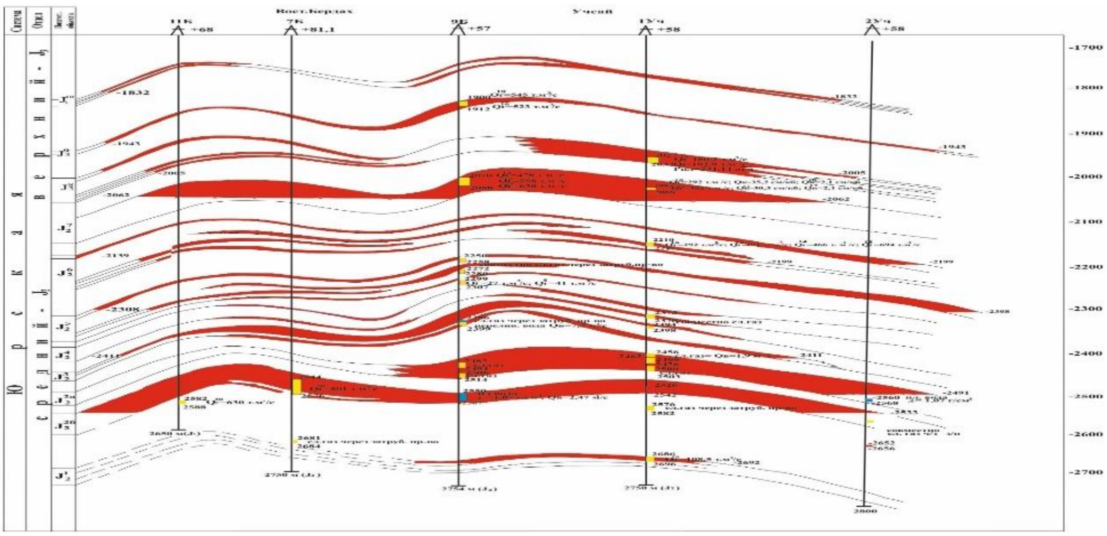

Fig. 2. Vostochny Berdakh, Uchsay deposits Geological profile along the line I-I (Compiled by: O. A. Zorina, L. I. Nesterova)

Attention is drawn to the fact that at the Urga field, the most capacious for the FES is the J32 + J32a bundle, which is associated with more than 20% of the reserves. This bundle is located in the roof part of the upper Jurassic. At the same time, at the Surgil-Sev fields. Aral and East.Berdakh-Uchsay this part of the section contains reservoirs with a sufficiently high porosity, but with a high content of residual water, which indicates the predominance of finer-grained (compared to Urga) differences in this part of the section [11, 15]. Comparison of the FEZ of productive bundles of the Urga and Surgil – Sev deposits. Ural, East. Berdakh-Uchsay.

Table 1

Batch index		Urga			Surgil-North.Aral			East Berdakh-Uchsay		
		$h_{ef\ sr}$	K_p,%	K_g/K_{ov}	$h_{ef\ sr}$	K_p,%	K_g/K_{ov}	$h_{ef\ sr}$	K_p,%	K_g/K_{ov}
1		2	3	4	5	6	7	8	9	10
J_3^1		2,2-3,4	20-23	1,76/0,24	2-4	22-26	0,59/0,41	2-4	14-16	-/0,25
J_3^2- J_3^{2a}		3-8	17-22	0,76-0,83 0,17-0,24	3-4	21-22	0,62-0,65 0,35-0,38	4-6	15-18	-/0,28
J_3^3		4-7	17-18	0,74-0,77 0,23-0,26	2-15	23-29	0,57-0,7 0,3-0,43	2-4	15-18	-/0,28
J_3^4		3-4	19-20	0,78/0,22	2-6	23	0,65/0,35	2-5	14-16	-/0,25
J_3^5		5-6	18-19	0,75/0,25	2-6	16-17	0,55-0,59 0,41-0,45	2-4	16-18	-/0,3
J_3^{5a}		5-6	15-16	0,74/0,26	3-10	22-24	0,63-0,64 0,36-0,37	2,6	15-16	-/0,3
J_3^6		6-7	15-16	0,74/0,26	2-6	18-24	0,6-0,72 0,28-0,4	2-4	15-16	-/0,3
J_3^7		6-10	16	0,74/0,26	4-5	17-23	0,6-0,72 0,28-0,4	2-3	16	-/0,35
J_3^{7a}		4-6	16-18	0,72-0,76 0,24-0,28	4	19	0,62/0,38	2-4	16-18	-/0,28
J_3^8		4-6	15-16	0,8-0,84 0,16-0,2	-	-	-	4-30	16-18	0,65/0,35
J_3^9		Not selected			Not selected			3-15	16-18	0,65/0,35
J_3^{10}		Not selected			Not selected			4-8	16-19	0,6-0,65 0,35-0,4
J_3^{11}		Not selected			Not selected			5-15	15-9	0,6-0,67 0,33-0,4
J_2^1+J_2^{1a}		4-8	17-20	-/0,22	2-9	17-24	0,57-0,7 0,3-0,43	4-20	15	0,65/0,35
J_2^2		2-12	16-18	-/0,26	2-10	18-22	0,66-0,75 0,25-0,34	16-30	15	0,67/0,33
J_2^3		2-8	17-19	-/0,3	2-4	18-22	0,69-0,72 0,28-0,31	8-20	15	0,65/0,35
J_2^4		4-6	15-18	-/0,28	2-5	16-20	0,6-0,7 0,3-0,4	4-12	13-15	0,66/0,34
J_2^5		4-8	16-18	-/0,28	3-7	18-19	0,7-0,73 0,27-0,3	8-12	14-15	0,7-0,73 0,27-0,3

J_2^6		2-10	13-18	-/0,26	2-10	13-21	0,62-0,75 0,25-0,38	8-16	14-19	0,7/0,3
J_2^7		2-8	13-19	-/0,3	2-8	14-20	- 0,28-0,37	8-16	14-19	0,7/0,3
J_2^8		4-12	15-17	-/0,35	12-30	15-23	0,57-0,74 0,26-0,43	4-14	16-18	0,65/0,35
J_2^9		2-6	13-15	-/0,4	2-3	14-15	0,62/0,38	2-4	14-16	-/0,37
1		2	3	4	5	6	7	8	9	10
J_2^{10}		2-10	12-15	-/0,4	4-20	14-17	0,61-0,75 0,25-0,39	2-6	14-16	-/0,36
J_2^{11}		4-12	13-15	-/0,42	5-17	11-20	0,62-0,78 0,22-0,38	2-8	12-16	-/0,38
J_1^1		6-8	13-16	-/0,44	4-6	12-16	-/0,4	2-8	14-16	-/0,38
J_1^2		10-18	12-16	-/0,35	4-8	11-15	-/0,44	2-6	12-16	-/0,4
J_1^3		6-8	13-16	-/0,38	2-4	11-14	-/0,48			
J_1^4		4-6	12-14	-/0,45						
J_1^5		4-8	12-14	-/0,44						
J_1^6		2-6	12-14	-/0,46						

CONCLUSION. The plantar part of the Upper Jurassic is productive in all fields. However, if in Urga these are sandstones with relatively low weights, then in Surgil, and especially in the East. Berdakhe-Uchsaye is one of the best reservoirs, which are associated with the main reserves in the East.

The main productive bundles in the Middle Jurassic are J22a+J22b, J23 and J27, and in Surgila they are J22, J26, J28 and J210, with which the main reserves are associated. At Urga, the number of collectors of these bundles is much lower, so non-industrial gas inflows are obtained there.

The terrigenous Jurassic reservoirs of the Sudochy trough are represented by sandstones with different granularity and clay content. Sandstone bundles, in general, are characterized by the variability of the FEZ in area and section. However, a comparison of the average values of the values of Kp, Kov. showed that, in general, they have similar FES and will have common features when they are developed.

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