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Carbonate sediments of Jurassic age in Surkhandarya megasinklinal coastal zones - the most promising objects of exploration for hydrocarbon reserves of the Republic of Uzbekistan

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Abstract. In this scientific article the authors carried out research and analysis of carbonate deposits of Jurassic age on the port zones of the Surkhandarya megasinklinal, which are the most promising objects of exploration for hydrocarbon raw materials of the Republic of Uzbekistan.

In particular, the analysis of deep drilling data at the areas of Aktash, Leilyakan, Maidan, Beshkyz, Aktau, Dasmanagh, Pakhtaabad and other facilities was considered. The analysis showed that even when wells reached depths exceeding 4,000 m, they ended up in the upper part of the Mesozoic and Cenozoic section, more often in the lowered, autochthonous parts of the overhanging zones.

Analytical work with the active use of deep drilling data and the results of other geological and geophysical works carried out at the South-Western spurs of the Gissar ridge mountains facilities, as well as a joint analysis of the available information on the geological structure of the overlying zones of the onboard parts of the Surkhandarya megasinklinal testifies to the almost mirror similarity of their geological structure. Based on the analytical factual information obtained, the following can be assumed:

- within the Sherabad-Sarykamysh and Babatag overhang zones, hydrocarbon clusters have localization, concentrated mainly in areas of tectonic wedging of limestones of the upper Jurassic;
- hydrocarbon deposits are presumably localized in areas prone to allochthonous faults.

The data obtained after the Geologic Exploration Works, as well as calculations after the analytical processing of actual materials, show that in most of the territory of the Surkhandarya megasinklinal, the traps of structures in Jurassic sediments are expected to be opened by deep drilling at depth intervals exceeding 5,000 m.

In the present study, the authors of the article selected the northern part of Babatag as the tectonic type of formed geological complexes, and also performed the corresponding analysis. The analysis showed that despite the significant costs, none of the deep wells was able to open saline carbonate Jurassic deposits.

Calculations show that the forecast gas reserves only within the Sherabad-Sarykamysh and Babatag supervige zones of the Surkhandarya megasinklinal amount to about 650 billion m^3. This indicates large reserves of industrial reserves of hydrocarbon raw materials in the region under consideration.

The purposeful search for zones of tectonic wedging of limestones of the Upper Jurassic in the coastal territories of the Sherabad-Sarykamysh and Babatag folded zones of the Surkhandarya megasinklinal will contribute to the growth of a significant supply of oil and gas of the corresponding industrial categories.

Key words: *geological structure, hydrocarbon raw materials (HC-raw materials), oil and gas-bearing regions, carbonate deposits, Surkhandarya megasinklinal, South-Western spurs of the Gissar ridge (SZOGH), geological exploration works (GEW), deposits, deep drilling, overwater zones*

For citation: Sh.A. Umarov, S.S. Khabibullaev, L.I. Nesterova, G.D. Avazova Karbonatnye otlozhenija jurskogo vozrasta na pribortovyh zonah Surhandar'inskoj megasinklinali – naibolee perspektivnye ob#ekty poiskovo-razvedochnyh rabot na uglevodorodnoe syr'jo Respubliki Uzbekistan [Carbonate sediments of Jurassic age in Surkhandarya megasinklinal coastal zones - the most promising objects of exploration for hydrocarbon reserves of the Republic of Uzbekistan]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 1-12. DOI https://doi.org/10.25689/NP.2021.3.1-12 (in Russian)

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Experience of geological modeling of AS reservoir in the Nefteyugansk region. Variability of oil reserve estimates depending on input data

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Abstract. The paper considers methodological approaches to modeling of reservoirs with continuous genesis. The study reveals that construction of the most reliable reservoir geological model depends directly on the amount, quality and completeness of input data. The example of one of the fields in the Nefteyugansk region is presented to demonstrate the influence of a priori data associated with vertical and horizontal distribution of productive reservoirs in the interwell space on oil reserves estimates.

Fey words: *three-dimensional geological modeling, continental sediments, seismic and geological interpretation, dynamic attribute, channel systems, lithologically screened accumulation, cube, probabilities, lithology cube*

For citation: Yu.S. Osipenko, O.A. Kolycheva, I.V. Buyakina, E.V. Smirnova Opyt geologicheskogo modelirovanija plasta AS mestorozhdenija Neftejuganskogo rajona. Variativnost' ocenok zapasov nefti v zavisimosti ot vhodnyh dannyh [Experience of geological modeling of AS reservoir in the Nefteyugansk region. Variability of oil reserve estimates depending on input data]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 13-31. DOI https://doi.org/10.25689/NP.2021.3.13-31 (in Russian)

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Integrated tools for reserves and resources inventory based on international SEC and SPE-PRMS standards

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Abstract. The paper describes the main challenges associated with current approach to the inventory and analysis of petroleum reserves based on international SEC, SPE-PRMS standards. Current solution to the challenges within this area of interest is considered. Third-party software programs have been analyzed to reveal the disadvantages. Proprietary solution enabling to overcome the above challenges is proposed.

Key words: *evaluation of petroleum reserves, estimation of petroleum reserves, inventory and analysis of petroleum reserves, production forecast, company resource base*

For citation: A.N. Emelyanov, A.G. Zemerov, O.A. Yadryshnikova, V.N. Dubovetskiy, E.A. Kaspranskiy, E.V. Tyazhev Kompleksnyj instrumentarij dlja uchjota zapasov i resursov po mezhdunarodnym standartam SEC, SPE-PRMS [Integrated tools for reserves and resources inventory based on international SEC and SPE-PRMS standards]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 32-46. DOI https://doi.org/10.25689/NP.2021.3.32-46 (in Russian)

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Possibility of using wellhead pressure build-up to determine the reservoir properties

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Abstract. As a result of limiting the possibility of carrying out hydrodynamic studies with downhole pressure gauges, it becomes necessary to carry out wellhead pressure gauges, which often leads to distortion of the actual results.

It was necessary to work out in more detail the factors that influence the reasons for the error of wellhead measurements when recording the pressure build-up curve, which, as a result, led to the need to assess the range of uncertainties and identify the main reasons for the lack of information in connection with the adjustment of the model to the actual data.

Key words: *Pressure build-up pressure, wellhead pressure measurement*

For citation: M.V. Zuev Vozmozhnost' ispol'zovanija ust'evyh KVD dlja opredelenija fil'tracionno-emkostnyh svojstv kollektora [Possibility of using wellhead pressure build-up to determine the reservoir properties]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 47-56. DOI https://doi.org/10.25689/NP.2021.3.47-56 (in Russian)

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Relationships for determination of geomechanical properties for Romashkinskoye oil field conditions

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Abstract. The paper presents the results of core analysis of geomechanical rock properties for the Romashkinskoye field. Correlations of geomechanical properties and parameters based on core data were obtained, as well as the relationships between these geomechanical properties and well logging data. The resultant data were used to create 1D geomechanical models of borehole instability intervals during drilling process in the Romashkinskoye field. The simulation results confirmed applicability of the correlations obtained.

***Key words**: core analysis, geomechanical properties, Young's modulus, Poisson's ratio, uniaxial compression strength, tensile strength, internal friction angle, 1D geomechanical modeling*

For citation: I.I. Girfanov, I.T. Usmanov O zavisimostjah dlja opredelenija geomehanicheskih svojstv dlja uslovij Romashkinskogo neftjanogo mestorozhdenija [Relationships for determination of geomechanical properties for Romashkinskoye oil field conditions]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 57-66. DOI https://doi.org/10.25689/NP.2021.3.57-66 (in Russian)

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Enhancement of high-viscosity index oil recovery and at the same time limit water inflow by chemical composition with a selective effect

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Abstract. This study covers the laboratory tests results of a chemical composition intended to intensify the production of high-viscosity oil and at the same time to reduce the watercut of the products extracted, by limiting the water inflow to the well. Watering out of the well products due to the breakthrough of contour waters along the more permeable part of the layer and coning of the layer water when developing reserves of high-viscosity oil – these are the actual problems in oil production.

This study is aimed at developing a reagent based on a mixture of various surface-active substances (surfactants) and alkali to intensify the production of high-viscosity oil and at the same time limit water inflow.

The experimental part of the study shows the behavior of the composition in a porous medium taking as an example a bulk model of oil and water saturated core, as well as a core model with residual oil saturation. The results of the leak-off tests confirmed the effectiveness of the composition developed.

Thus, the developed chemical composition has a selective effect: it allows intensifying the production of high-viscosity oil and at the same time limiting water inflow, ensuring inflow profile modification in producing wells.

Key words: *surfactants, high-viscosity oil, water control, intensify the production, filtration tests, selective effect*

For citation: O.V. Gladunov, S.A. Kozlov, I.V. Tsarkov, K.I. Babitskaya, V.E. Chomaryan Intensifikacija dobychi vysokovjazkoj nefti s odnovremennym ogranicheniem vodopritoka himicheskimi rastvorami selektivnogo dejstvija [Enhancement of high-viscosity index oil recovery and at the same time limit water inflow by chemical composition with a selective effect]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 67-83. DOI https://doi.org/10.25689/NP.2021.3.67-83 (in Russian)

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Using statistical machine learning methods to optimize well operation

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Abstract. Machine learning finds its way into a wide variety of fields of science and technology. The essential condition for its use is the availability of digital factual material. Over the long history of the operation of oil fields, a significant database has been accumulated related to the development and applied methods of well stimulation.

The paper discusses the statistical methods of machine learning for the analysis of operational parameters at the producing oil wells of the Sotnikovskoye field. In particular, based on the production wells fund, the values of the target parameters are calculated by choosing a set of factors (the nominal number of oscillations of the pumping unit per minute, the nominal stroke length of the stuffing box rod), which make it possible to optimize the operation of the well, namely, to achieve the highest pump flow rate.

Key words: *well mode optimization, well performance forecasting, machine learning, neural networks, decision tree regression, MLPRegressor multilayer perceptron, LightGBM gradient boosting*

For citation: A.V. Nasybullin, R.R. Baiburov Ispol'zovanie statisticheskih metodov mashinnogo obuchenija dlja optimizacii jekspluatacii skvazhin [Using statistical machine learning methods to optimize well operation]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 84-94. DOI https://doi.org/10.25689/NP.2021.3.84-94 (in Russian)

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Efficiency of hydraulic fracturing in a Potochny fild

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Abstract. The development of most deposits is complicated by low permeability, heterogeneity and complex structure. For such fields, the introduction of technologies requires the intensification of the inflow to the bottom of the producing well. Hydraulic fracturing (is one of the most common methods of oil recovery. For the study, a problematic, heavily exploited and the main object of the Flow field – the Achimovskaya strata object-was selected: the state of development of this object was considered. The types of hydraulic fracturing used at this field were considered in the work: Hydraulic fracturing according to the "SlugFrac" technology, hydraulic fracturing with cooling of the bottom-hole zone, two-stage hydraulic fracturing, multi-stage hydraulic fracturing according to the TTS technology. As a result of the analysis of each species, it was concluded that each of the above species are effective. The hydraulic fracturing parameters were calculated. The resulting skin factor after the hydraulic fracturing became negative, which shows the effectiveness of the measures. According to the results of calculations, the debit will increase by 2.8 times.

Key words: *Potochnoe field, Achimovskaya strata object, proppant, flow rate, analysis of field development, development efficiency, intensification of inflow, method of increasing oil recovery, hydraulic fracturing, calculation of hydraulic fracturing parameters*

For citation: N.Z. Yumangullova, G.R. Ganieva, I.F. Minkhanov_Jeffektivnost' provedenija gidrorazryva plasta na Potochnom mestorozhdenii [Efficiency of hydraulic fracturing in a Potochny fild]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 95-111. DOI https://doi.org/10.25689/NP.2021.3.95-111 (in Russian)

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Evaluation of rock failure induced by steam injection

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Abstract. The paper presents the steps for running a geomechanical model for steam injection modeling. Two types of rock integrity failure are analyzed: tensile and shear failure. In the present case, shear failure of cap rock occurs after 40 months of steam injection. Such failures should be taken into account in subsequent reservoir simulation modeling through coupling the geomechanical and reservoir simulation models.

Key words: *maximum steam injection pressure, rock damage, thermal-hydraulic-mechanical model, land surface displacement, shear failure, tensile failure*

For citation: A.T. Zaripov, I.A. Islamov Ocenka narushenija celostnosti porody pri zakachke para [Evaluation of rock failure induced by steam injection]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 112-127. DOI https://doi.org/10.25689/NP.2021.3.112-127 (in Russian)

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Methodology of selecting aerodynamic pattern of the ejector for injecting water-gas mixture into the formation

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Abstract. This article is devoted to the adaptation of the methodology for choosing the aerodynamic pattern of liquid-jet compressors (ejectors) by K.G. Donets for use as part of a pump-ejector system on an injection well.

For the conditions of a well of one of the fields in Tatarstan, the parameters for choosing an ejector were calculated according to a technique adapted by the authors; pressure and energy characteristics were constructed for each of the schemes proposed by K.G. Donets, given reasonable recommendations for choosing the optimal pattern.

Key words: *pump-ejector system; water-gas mixture; associated petroleum gas; injection of a water-gas mixture using nitrogen*

For citation: V.N. Kalinnikov, A.N. Drozdov Metodika vybora ajerodinamicheskoj shemy jezhektora dlja zakachki vodogazovoj smesi v plast [Enhancement of high-viscosity index oil recovery and at the same time limit water inflow by chemical composition with a selective effect]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 128-140. DOI https://doi.org/10.25689/NP.2021.3.128-140 (in Russian)

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Study of the effect of nitrogen injection on oil treatment process

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Abstract. This paper presents the results of the laboratory study of nitrogen injection into a reservoir to increase oil recovery and considers the effects of this technology on the process of on-site oil treatment. Nitrogen injection was simulated in laboratory PVT unit. Then dehydration experiments with treated water/oil emulsion were conducted under standard conditions at different temperatures and demulsifier dosages.

***Key words**: enhanced oil recovery methods, nitrogen injection technology, gas injection, oil treatment, oil dehydration, demulsification, effect on treatment*

For citation: V.N. Kalinnikov, O.S. Sotnikov, L.N. Shakirova, R.I. Shakirov Issledovanie vlijanija obrabotki plastovogo fljuida azotom na process podgotovki nefti [Study of the effect of nitrogen injection on oil treatment process]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 141-148. DOI https://doi.org/10.25689/NP.2021.3.141-148 (in Russian)

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УДК 622.243.24

Reducing risk ways of horizontal wells drilling

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Abstract. Horizontal drilling is a present-day method of oil field development. Horizontal well efficiency depends largely on taking proper solutions during drilling technical support, as well as on some geological and technical factors.

The paper discusses efficient ways of reducing key geological risks when planning and drilling horizontal wells and side tracks.

Key words: *horizontal well, geological risks and uncertainties, geological model*

For citation: K.V. Konstantinov, E. I. Lapina, V.A Pukharev Puti snizhenija riskov pri burenii gorizontal'nyh skvazhin [Reducing risk ways of horizontal wells drilling]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 149-162. DOI https://doi.org/10.25689/NP.2021.3.149-162 (in Russian)

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Optimization of well completion on the Russkoe field

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Abstract. A method of searching attractive areas for multilateral wells and for horizontal sidetracking is presented in the article. We need cube of lithology and oil-filled thickness map for creation perspective zones maps. The method allow increase oil production and improve net present value.

Key words: *multilateral well, multibranched well, branched well, horizontal sidetracking, map of perspective zones*

For citation: Y.I. Luzina Optimizacija sistem zakanchivanija skvazhin na Russkom mestorozhdenii [Optimization of well completion on the Russkoe field]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 163-169. DOI https://doi.org/10.25689/NP.2021.3. 163-169 (in Russian)

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The regulatory role of the state in the field of geological exploration of the subsurface

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Abstract. The analysis of the normative legal regulation of relations in the field of geological exploration of the subsurface, as well as materials of law enforcement practice, is carried out. In the course of the analysis, it was revealed that the regulatory legal support for the state geological study of the subsurface is incomplete and fragmentary and requires updating and systematization. The conclusion is formulated that the most productive and effective scenario for the systematization of norms in the field of state geological study of subsurface resources may be a return to the idea of adopting the federal law "On Geological Study of Subsurface resources", which will fix the general basic requirements for the composition and types of work on state geological study, design, quality of geological information.

Key words: *subsurface use; geological study of subsurface resources; state regulation in the field of geological study; stages and stages of geological exploration, contract system in the field of procurement*

For citation: A.A. Popov, R.N. Salieva Regulirujushhaja rol' gosudarstva v sfere geologicheskogo izuchenija nedr [The regulatory role of the state in the field of geological exploration of the subsurface]. Neftyanaya Provintsiya, No. 3(27), 2021. pp. 170-188. DOI https://doi.org/10.25689/NP.2021.3.170-188 (in Russian)