Segendyk-Peschanomysskoe late paleozoic-early triassic buried uplift South Mangyshlak trough and its petrogeological significance

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Abstract. The Triassic deposits of the Southern Mangyshlak have undergone significant post-sedimentation transformations. Modern reservoirs containing accumulations of oil and gas are, as a rule, epigenetic in nature. However, in some areas, the preservation of the primary pore capacity by rocks lying in the lower horizons of the Triassic section was found. It has been established that such reservoir layers are confined to the carbonate-terrigenous thickness of the Lower Triassic, which contains arkose sandstones, which are the product of the destruction of granitoid intrusions of the Paleozoic basement. Detailed lithological and petrographic analysis of Paleozoic and Triassic deposits allowed us to restore the paleotectonic situation of the end of the Paleozoic – the beginning of the Early Mesozoic. A previously unknown large buried uplift was revealed, which was at that time an area of erosion. Coarse-grained material accumulated on the periphery of the uplift. Its lithological and mineralogical features caused the preservation of primary pores against the background of other low-permeable sedimentary rocks composing the Triassic section. The results obtained can be used in the practice of geological exploration for oil and gas.

Key words: *Southern Mangyshlak, Upper Paleozoic, Triassic, lithology, arcoses, reservoirs*

Application of a new innovative technique in studying, searching and exploration of oil and gas fields on the example of the Karakum areas

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Abstract. This article presents a scientific rationale for the search and exploration of oil and gas formation processes using innovative research methods on the example of the Karakum area, and also developed a new innovative methodology for drilling and searching for oil and gas promising structures in the Jurassic and Paleozoic deposits.The conducted scientific research is based on a large amount of factual material obtained from the results of drilling with the development of a new stratigraphic breakdown in relation to the North Ustyurt oil and gas region. Based on the results of a detailed analysis and correlation of sections with the identification of productive horizons of the Jurassic deposits and available seismic profiles, it is recommended to drill an exploration well No. 3 in the Karakum area.

Key words: stratigraphy, Jurassic and Paleozoic deposits, Ustyurt oil and gas region, hydrocarbon raw materials, paleontological materials, geophysical data, formation, drilling, well, interval, block

Correlation between filtration-capacitance and thermal properties of oil-saturated reservoirs of extra-viscous oil deposits (SVN). Adabtation of hydrodynamic model.

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Annotation. The study of thermal properties of rocks is the basis for the application of geothermy methods in prospecting, exploration and exploitation of mineral deposits. Design and optimization of oil production methods with thermal influence on the productive formation, especially in the production of viscous oils, interpretation of thermal logging data, modeling of heat and mass transfer processes in reservoirs at various stages of field development, study of thermal regimes of deep horizons in sedimentary basins, analysis of the influence of the thermal regime of the subsurface on the process of geothermal exploration and exploitation of mineral deposits. Such a thermal characteristic of oil-saturated rocks as the temperature coefficient of linear expansion is required for accurate assessments of the stress state of the borehole space and rock mass when using thermal methods of impact on the reservoir. In this regard, increasing the level of reliability of information about the listed thermal properties of reservoirs, and in particular - terrigenous reservoirs, is an urgent task of modern geophysics.

The development of methods for determining and studying the thermal properties of rocks was carried out by many scientists, including H.I.Amirkhanov, P.V.Bridgman, K.V.Vasiliev, V.A.Vertogradsky, S.P.Vlasova, V.S. Volkenstein, V.K.Gordienko, V.N.Dakhnov, I.D.Dergunov, G.N.Dulnev, A.D.Duchkov. Volkenstein, V.K.Gordienko, V.N.Dakhnov, I.D.Dergunov, G.N.Dulnev, A.D.Duchkov, D.I.Diakonov, D.Eger, U.Seipold, V.E.Zinoviev, G.Karslow, G.M.Kondratiev, R.I.Kutas, A.A.Lipaev, B.A.Yakovlev and others.

Keywords: core material, thermophysical properties of rocks, reservoir rock, extra-viscous oil, filtration-capacitance properties, core material temperature, thermal diffusivity, specific heat capacity, thermal conductivity

Generalization of the results of determining the maximum horizontal principal stress of the formation before and after hydraulic fracturing at the facilities of the deposits of Western Siberia

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Abstract. Large fields in Western Siberia are at the latest stage of development, which are characterized by low rates of oil production, high water cut of the extracted resources and a decrease in the number of operating well stock. Current circumstances make it necessary to recover undeveloped volumes of remaining oil in place by using hydraulic fracturing on a complicated stock of candidate wells (risky water cut zones, marginal areas of the deposit, poorly continuous shale barrier). All this leads to an increase in the probability of premature flooding of wells due to hydraulic fracture breakthrough in non-target water-saturated formation, and as a result, obtaining a low effect of oil-production rate because of all available reserves are not involved in the filtration process to the well. For optimal planning of hydraulic fracturing design requires reliable information about the geomechanical parameters of the rock, its structure and azimuth direction, which plays a key role. The purpose of the work is to determine the dominant direction of the maximum horizontal principal stresses in the deposits of Western Siberia by the integrated use of well logging and microseismic monitoring for each of the groups of objects (A, B, Achim and J), as well as to provide practical examples of the application of technological methods to hydraulic fracturing that can reduce the level of water cut during the wells exploitation time.

Key words: Hydraulic fracturing, Western Siberia, hydraulic fracturing technologies, two-stage hydraulic fracturing, three-stage hydraulic fracturing, multi-stage hydraulic fracturing, maximum horizontal principal stress, fracture direction

Forecasting the dynamics of oil flow rate changes using machinne learning methods

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Abstract. This paper presents the experience of using machine learning methods to predict the technological indicators of the development of wells operating in carbonate reservoirs. The stages of creating, training a recurrent neural network with a long short-term memory in a test area (small deposit) and subsequent forecasting of oil flow rate by wells for a 3-6 month perspective are described. In order to evaluate the effectiveness of this approach, a test was carried out on a control sample and the forecast results were compared with forecasting by alternative methods, and in particular with forecasts of the geological and hydrodynamic model, the dip curve and the material balance model. Modeling object carbonate deposits of oil field N, located in the Volga-Ural oil and gas province.

Key words*: machine learning, carbonate reservoirs, Tournaisian, recurrent neural network, water cut, oil production rate, dip curve, geological and hydrodynamic model, material balance, forecast*

On evaluating IOR efficiency in terms of cyclic flooding and polymer cyclic flooding

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Abstract. The effectiveness of cyclic and polymer-cyclic technologies for heterogeneous layered oil reservoirs during different periods of development was evaluated. Computational experiments were carried out on the Tempest-More hydrodynamic simulator by ROXAR. It was revealed that the estimated value of additional oil production from the impact on reservoirs significantly depends on the moment when this assessment is made. So the best variant of the technology at the end of the effect from the impact may not be the best by the final ORF.

Keywords: cyclic waterflooding, polymer waterflooding, injection half-period, technological efficiency, oil recovery factor

Improving the efficiency of using the jet pump layout in the development of oil wells

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Abstract. The work presents a new approach to the development of oil wells by using a jet pump system with modified components and an optimized sequence of operations for inflow stimulation and well hydrodynamic research.

This approach allows for: reducing non-productive costs by eliminating additional wireline operations for retriening information froma pressure gauge beneath the packer, making informed decisions on the feasibility of conducting geological and technical operations, evaluating the effects of reservoir treatment, promptly sampling reaction products after acid treatment, and selecting optimal kill fluid densities based on preliminary energy information.

Key words: *jet-type pump, oil well testing, well interventions, unconventional reserves development, pressure transient analysis, PBU curve, retrievable back-pressure valve*

Automation and control of injection accounting as an element of digital technologies

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Abstract. This article considers the experience of public joint-stock company TATNEFT in the implementation of automated injection water control tools as part of the creation of an integrated model (hereinafter IM) of the oil field N, that combining reservoir model with well`s models of surface net. The available tools for fluid accounting and pressure measurement at the simulated objects were insufficient in terms of adaptation the production, injection and pressure on IM. Therefore, it was decided to start the implementation of the field digitalization project in parallel, starting with a reservoir pressure maintenance system (hereinafter referred to as RPM). The available developments in the analysis of initial information needed in IM were used to determine the points of installation for the NOTA-V flowmeters on RPM network. As a result of the field digitalization program, a platform was created with N field`s database, which automatically updates from new meters and allowing real-time monitoring the state of the well stock, thus increasing data accuracy and speed of response to emerging incidents.

Based on the new information, comparative calculations were performed by IM, showed the increase in the accuracy of calculations and project management. The most significant was the reliable distribution of injected water among injection wells and getting one-time information in real time.

Key words: automation, maintaining reservoir pressure, fluid injection metering, digital technologies, geological and dynamic model, integrated field model, flow meters, Modeling Center, ASDKU

Optimizing water injection system facilities
based on the digital model

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Abstract. The paper discusses TATNEFT's experience in identifying pipelines and their sections within a water-injection system that have high hydraulic resistance based on surface facilities digital model.

Infill drilling is planned for the Bondyuzhsky oil field. Since the water injection system is closed (i.e., it is impossible to transfer produced water to TATNEFT's adjacent fields), a digital model of water-injection surface facilities was decided to be built to determine the existing water system capacity. When building the model, actual pipeline geometry and actual characteristics of all water lines were taken into consideration. Profile of calculated wellhead pressures for water-injection wells, obtained from the model, testified that the values were overestimated compared to the actual measurements. In this context, the model was history-matched, including model sensitivity analysis by changing various parameters, specifically, choke size, pipe roughness, pipe ID, and using various types of calculation correlations, and hydrostatics and friction correction factors. Water lines matching was performed according to liquid flowing from the source to the sink. The obtained coefficients of water line diameter changing were analyzed. The results showed that in 29% of water lines, high hydraulic resistance was attributed to some technical issues. Several recommendations have been provided for the rest of the water lines on carrying out certain measures as new wells are put on stream and the amount of liquid pumped over these water lines, increases.

Key words: *surface network, pipelines, water line, wellhead pressure, injectivity, injection, history matching, diameter*

Bratsk gas condensate field oil production prospects

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Abstract. The subsoil user enterprise, which conducts socially significant, but, for objective reasons, unprofitable gas and gas condensate production at a small field in the Irkutsk region, has the potential to become profitable by ensuring oil production. For this, there are quite certain prerequisites, the geological, technological and infrastructure aspects of which are disclosed in the article. An analysis of the available geological and geophysical data was carried out using information on analogous fields, geological constructions were performed, approaches to the separation of reef bodies at the Bratskoye field were proposed, which have their own characteristics, and technological principles for opening and development of the facility were recommended.

Key words: *osinsky horizon, cyclites, dolomites, secondary transformations, organogenic structures*