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Deposition, epigenesis, and hydrocarbon generation potential of Paleozoic sediments in South-Salyukinskaya area

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Abstract. Comprehensive analysis of sedimentation environment of the South-Salyukinskaya area, epigenesis of the Paleozoic rocks, and hydrocarbon generation potential of the dispersed organic matter has been performed. A representative collection of rock samples dated to the Ordovician, the Silurian, and the Devonian was studied. Analyses using present-day technologies including pyrolytic, petrographic, and electron-microscopic methods, were carried out. Extent of dispersed organic matter in rocks, its catagenetic maturity, and hydrocarbon generation potential were evaluated.

Key words: *sedimentation environment; Paleozoic rocks; dispersed organic matter; generation potential*

For citation: T.A. Ryazanova, N.P. Devytka, V.V. Markov, I.G. Pavlutkin Formirovanie i jepigenez paleozojskih porod Juzhno-Saljukinskoj ploshhadi, ih potencial k generacii uglevodorodov [Deposition, epigenesis, and hydrocarbon generation potential of Paleozoic sediments in South-Salyukinskaya area]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 1-18. DOI https://doi.org/10.25689/NP.2022.2.1-18. EDN BHRCCW (in Russian)

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EDN BLTPRW

УДК 553.91.041

Methodological basis of geological modeling of Uzbekistan subsurface areas on the example of consideration and using “Integral geology” module

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Abstract: This article considers the methodological foundations of geological modeling of the subsoil of Uzbekistan using the method of integral geology.

Uzbekistan occupies one of the leading places in the world in terms of reserves, extraction and processing of minerals. The need for efficient and rational use of resources is the basis of ongoing reforms in the economy of the Republic. Continuous and systematic geological exploration of subsoil as well as efficient exploration is a priority for the entire economy.

Geological modeling is the basis for the development of any deposit. The rapid development of information and communication technologies and the achievements of scientific and technological progress makes it possible to make geological models digital, which take into account a set of geological and geophysical factors up to the physical essence of the process.

The methodological basis for creating and forming a full-fledged base of geological and geophysical materials is a separate direction, which was called "Integral Geology." Integral geology is based on the complex processing of multi-vector and factual information in order to systematize and develop an algorithm for complex geological modeling of the subsoil of Uzbekistan. Integral geology is presented as a universal methodology for the study of geological space, based on the technology of computer-mathematical modeling and system analysis of natural and geological objects.

Keywords: *modeling of deposits, geostatistics, mathematical modeling, geological modeling, geological objects, integrated geology, algorithm, complex processing, many and vector information, factual information, systematization of information*

For citation: Sh.A. Umarov, S.S. Khabibullaev, I.N. Khakimzyanov, L.I. Nesterova Metodologicheskie osnovy geologicheskogo modelirovanija nedr Uzbekistana na primere rassmotrenija i ispol'zovanija modulja «Integral'naja geologija» [Methodological basis of geological modeling of Uzbekistan subsurface areas on the example of consideration and using “Integral geology” module]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 19-43. DOI https://doi.org/10.25689/NP.2022.2.19-43. EDN BLTPRW (in Russian)

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EDN CHVNEP

УДК 551.86

Model studies of clinoform sediments by example of unique fields

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Abstract. The paper presents basic characteristics and geological aspects of productive clinoform formations of a number of unique Siberian fields. Geologic modeling algorithms and approaches are described in some detail. Emphasis is made on importance of sedimentological analysis, regardless of exploration maturity, to improve model reliability.

Materials and methods. Materials: seismic data base of Samotlorskoye and Paiyakhskoye fields, recommended practices for creation of full-scale 3D geologic models, scientific papers of BashNIPI related to modeling and support of the Priobskoye field development project.

Methods: 3D geologic modeling, seismic facies analysis, building of trend maps.

Key words: *geologic model, Samotlorskoye field, Paiyakhskoye field, seismic facies analysis, lithofacies analysis, clinoform sediments*

For citation: N.A. Kantemirova, E.V. Smirnova Opyt modelirovanija klinoformnyh otlozhenij na primere unikal'nyh mestorozhdenij [Model studies of clinoform sediments by example of unique fields]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 44-60. DOI https://doi.org/10.25689/NP.2022.2.44-60. EDN CHVNEP (in Russian)

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EDN FPNTCW

УДК 622.276.031

Nuclear spin-lattice magnetic relaxation of alkanes and water in a porous medium of clay minerals

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Abstract. The molecular mobility of liquid in porous media studies are related to understand fundamental and practical issues. Fundamental issues include the pore space geometric and transport characteristics, the interaction between liquid and the solid phase surface. Practical issues include oil and gas migration, the impact of clay on reservoir capacity and permeability, estimation of reserves and oil production, and others. The nuclear magnetic resonance method, in particular, spin-lattice nuclear magnetic relaxation of a liquid in liquid-porous medium systems helps to get answers to the listed questions. Information is obtained on both molecular state of fluids and porous medium structure. The initial quantitative parameters in such studies are the times of nuclear magnetic relaxation. As a rule, the dependencies of relaxation times have a complex, non-exponential form and are interpreted in different ways by different authors. The purpose of the work is clarification the features of spin-lattice relaxation of model liquids in clay minerals porous media - kaolinite and montmorillonite by the method of pulsed nuclear magnetic resonance.

Key words: *the nuclear magnetic resonance, spin-lattice magnetic relaxation, kaolinite, montmorillonite, reservoir, clay content, porous medium*

For citation: N.K. Dvoyashkin, M.V. Belousova, R.N. Burkhanov Jadernaja spin-reshetochnaja magnitnaja relaksacija alkanov i vody v poristoj srede glinistyh mineralov [Nuclear spin-lattice magnetic relaxation of alkanes and water in a porous medium of clay minerals]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 61-76. DOI https://doi.org/10.25689/NP.2022.2.61-76. EDN FPNTCW (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.77-87

EDN GLIGOX

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Assessment of efficiency of complex technology for development of stocks of kizelovsky oil of the horizon Bavly field

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Abstract. Experience of design of systems of development of low-power low-productive objects of fields with rather small stocks of oil shows that their operation with application of only traditional vertical wells is insufficiently effective, in most cases – is unprofitable. At the same time options of development of fields by exclusively wells with the horizontal termination as not in all geological conditions their drilling is rational practically are not recommended.

Key words: *well with the horizontal termination, the massive and layered structure, the condensed carbonate breeds, skilled sites, complex technology of development, the net discounted income*

For citation: L.V. Zatsarina, I.S. Kuchinskaya Ocenka jeffektivnosti kompleksnoj tehnologii dlja vyrabotki zapasov nefti kizelovskogo gorizonta Bavlinskogo mestorozhdenija [Assessment of efficiency of complex technology for development of stocks of kizelovsky oil of the horizon Bavly field]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 77-87. DOI https://doi.org/10.25689/NP.2022.2.77-87. EDN GLIGOX (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.88-97

EDN LGRAVP

УДК 622.276.031.011.43:550.822.3

Influence of rock sample size on anisotropy of strength properties

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Abstract. Effect of dimensions of rock samples characterized by anisotropy-associated variations in strength vs. direction is discussed. Subjects of such studies are isotropic rocks, as a rule, however, when anisotropy of strength properties is high, findings of research can be of interest. For this study, input data from published literature were used. Some authors mention that aspect ratio changed over a wide range. Failure criterion, which is essentially a generalization of a classical Mohr–Coulomb linear criterion, was used to determine shear strength and angles of internal friction along various directions. No physical experiments were performed. The problem was solved for conditions of lateral thrust variations; failure pressure for different lateral thrust – failure pressure ratios was determined. Calculations show that the effect of dimensions of rock samples is mostly pronounced when failure pressure is notable across or along the layers at different lateral thrust. In the range of 30° to 60°, the effect is minimal.

Key words: *anisotropy, sample size, strength, load, layers, compression, rock, strength criterion*

For citation: M.M. Aliev, Z.F. Ismagilova, N.N. Burmistrova, E.A. Sozontova Vlijanie razmerov obrazca gornoj porody na anizotropiju prochnostnyh svojstv [Influence of rock sample size on anisotropy of strength properties]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 88-97. DOI https://doi.org/10.25689/NP.2022.2.88-97. EDN LGRAVP (in Russian)

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EDN LMZVEW

УДК 622.276.66.001

Hydraulic fracturing. Special aspects and potential of process type assignment

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Abstract. Design and execution of hydraulic fracturing treatment is a comprehensive and complex organizational and technological business process. The results rely on both internal and external factors: workover contractor services (preparatory and post-frac operations), well logging (updated geological and technical characteristics, condition monitoring), hydraulic fracturing (frac treatment placement), performance of individual departments of production company (real-time planning and selection of production enhancement methods, supervision of hydraulic fracturing process) and others. It is not always possible to account for all factors while planning and executing hydraulic fracturing operations.

In light of the above, it is important that potential and/or optimal unified approaches and standard solutions for each individual stage of hydraulic fracturing process be proposed. This will enable replication of the best practices within the Company.

Type assignment to technological processes is based on preliminary study and analysis of specific aspects associated with a particular technology and generalization of the best practices. These best practices are viewed as technological regularities applicable to appropriate classification groups.

Standard design system at Rosneft Oil Company is arranged as a tool for implementation and application of a unified technical policy, and its development is one of the Company's strategic goals. One of the promising areas of standard design system implementation is geology and reservoir engineering. Standard design system in geology and reservoir engineering aims to cover the full operation cycle: from subsurface exploration to oil, gas, and gas condensate production and processing.

Key words: *standard design, type assignment, unification, geology, reservoir engineering, technology, hydraulic fracturin*

For citation: A.N. Kravchenko, V.V. Vasilev, O.V. Salimov, M.I. Samoilov Gidravlicheskij razryv plasta. Osobennosti i vozmozhnosti tipizacii processov [Hydraulic fracturing. Special aspects and potential of process type assignment]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 98-113. DOI https://doi.org/10.25689/NP.2022.2.98-113. EDN LMZVEW (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.114-122

EDN NUUDDW

УДК 622.276.1/.4

Influence of the filtration channels area on well productivity during the secondary opening of the productive horizon in the carbonate sequence

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Abstract. On the example of a high-viscosity oil deposit of the Bashkirian stage of the field in the Melekesskaya depression, an assessment was made of the influence of filtration channels on the production capabilities of wells. The methodological approach adopted in the analysis made it possible to come to the conclusion: 1) about insufficient density of perforation holes during the secondary opening of the carbonate productive horizon; 2) under conditions of saturation of reservoir rocks with high-viscosity oil, the depth of penetration of perforation holes begins to play a less significant role; 3) on the availability of a reserve of production opportunities to increase the productivity of wells.

Key words: *Carbonate reservoir, high-viscosity oil, Bashkirian stage, Melekesskaya depression, secondary exposure, low-productive reservoir, perforation, filtration channel, optimization of perforation density, methodical approach*

For citation: R.Z. Mukhametshin, R.R. Sadykov**.** Otsenka vliyaniya ploshchadi fil'tratsionnykh kanalov na produktivnost' skvazhiny pri vtorichnom vskrytii produktivnogo gorizonta v karbonatnoy tolshche [Influence of the filtration channels area on well productivity during the secondary opening of the productive horizon in the carbonate sequence]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 114-122. DOI https://doi.org/10.25689/NP.2022.2.114-122. EDN NUUDDW (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.123-136

EDN ULJXEC

УДК 622.276.63

Evaluation of the technological effectiveness of chemical stimulation methods applied to the bottomhole zone (BHZ)

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Abstract. The paper discusses the evaluation of the technological effectiveness of chemical stimulation methods applied to the bottomhole zone.

The regulation of hydrocarbon production processes includes a variety of enhanced oil recovery methods, which include the application of bottomhole stimulation techniques. The BHZ is the area of the reservoir around the wellbore that is subjected to the most intense stimulation during oil and gas recovery operations. Often during the operation of a well, due to inadequate techniques of penetration of productive formations, natural permeability of rocks in the bottomhole zone deteriorates, productivity decreases, etc.

Chemical treatment of the bottom-hole zone (BHZ) includes various bottom-hole zone treatments to increase BHZ permeability by cleaning pore channels from resins, asphaltenes, clays, salts and other materials deposited in them.

Key words: *bottom-hole zone, bottom-hole zone treatment, hydrochloric acid treatment, clay acid treatment*

For citation: S.A. Dolgih, D.I. Gajsina Primenenie himicheskih metodov vozdejstvija na prizabojnuju zonu plasta (PZP) [Evaluation of the technological effectiveness of chemical stimulation methods applied to the bottomhole zone (BHZ)]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 123-136. DOI https://doi.org/10.25689/NP.2022.2.123-136. EDN ULJXEC (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.137-149

EDN WQXIYR

УДК 622.276.6

Selection of best IOR/EOR technologies based on analytic hierarchy process

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Abstract. The authors discuss the problem of selection of alternative solutions, in particular, selection of IOR/EOR technologies for a concrete geological environment. To solve this problem, the analytic hierarchy process developed by Thomas Saaty in 1970s is offered. It is shown that the method can come into use in petroleum industry. Case studies are presented.

***Key words**: hydraulic fracturing, analytic hierarchy process, selection of alternative solutions*

For citation: A.N. Kravchenko, V.V. Vasilev, O.V. Salimov Vybor nailuchshih reshenij podbora tehnologij GTM na osnove metoda analiza ierarhij [Selection of best IOR/EOR technologies based on analytic hierarchy process]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 137-149. DOI https://doi.org/10.25689/NP.2022.2.137-149. EDN WQXIYR (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.150-160

EDN XHHABO

УДК 622.276

Assessing the impact of hydraulic fracturing on the operation of neighboring wells by the example of a carbonate reservoir deposit in Perm region

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Abstract: The article describes the analysis and results of studies conducted to establish the dependence of the influence of hydraulic fracturing on the work of neighboring wells on the example of one of the objects of the Perm region field development. The relevance of the study is due to the fact that hydraulic fracturing (HF) is one of the main methods of oil production intensification not only in the Perm region, but throughout Russia. It has been established that hydraulic fracturing led to a decrease in the flow rates of neighboring wells of the object of development under consideration. Also responding producing wells have an average flow rate equal or lower after hydraulic fracturing operation. This study is only the first step, and for a more in-depth and comprehensive analysis, it is necessary to study the information about the mutual influence of wells.

Key words: *hydraulic fracturing, carbonate reservoir, well impact, fracture, perm, reservoir, oil flow rate, injectivity, enhanced oil recovery method*

For citation: E.A. Kudanov Ocenka vlijanija gidravlicheskogo razryva plasta na rabotu sosednih skvazhin na primere karbonatnoj zalezhi mestorozhdenija Permskogo kraja [Assessing the impact of hydraulic fracturing on the operation of neighboring wells by the example of a carbonate reservoir deposit in Perm region]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 150-160. DOI https://doi.org/10.25689/NP.2022.2.150-160. EDN XHHABO (in Russian)

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EDN YSINLW

УДК 622.244.4.06

The results of laboratory testing and analysis of the use of a cationic drilling mud system in the construction of wells by sidetracking in the fields of Western Siberia

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Abstract. The results of laboratory testing and the experience of using cationic systems of drilling fluids during the overhaul of wells by the sidetracking at the fields of LUKOIL-Western Siberia LLC is presented.

In order to reduce the volume of drilling waste when the sidetracking, laboratory studies were carried out to determine the maximum "lifetime" of cationic drilling mud and assess the possibility of its reuse.

Key words: *cationic drilling fluids, sidetracking, mudstones*

For citation: E.V. Babushkin, M.G. Buyanova, R.M. Nizamutdinova, A.A. Gushchina Rezul'taty laboratornyh issledovanij i analiz primenenija kationnoj sistemy burovogo rastvora pri zarezke bokovyh stvolov na mestorozhdenijah Zapadnoj Sibiri [The results of laboratory testing and analysis of the use of a cationic drilling mud system in the construction of wells by sidetracking in the fields of Western Siberia]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 161-173. DOI https://doi.org/10.25689/NP.2022.2.161-173. EDN YSINLW (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.174-192

EDN ZPSNHR

УДК 622.276.1/.4

Contribution of R.G. Abdulmazitov to the development of Tatarstan oil industry and its scientific heritage

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Abstract. The Article, Dedicated to the Memory (75th Birthday) of the Outstanding Scientist and Inventor, Considers his Achievements in the Development Design, Analysis of the Development of Hard-To-Recover Oil Reserves in the Tatarstan Oil Fields and the Creation of Effective Technologies for this.

Key words: *Outstanding Scientist, Inventor, Anniversary, Oil Field, Production Facility, Hard-To-Recover Reserves, Flooding, Pilot Work, Complex Reservoir, Low-Productivity Formation, Optimization Of Well Pattern Density, Merits, Achievements*

For citation: R.Z. Mukhametshin. Vklad R.G. Abdulmazitova v razvitiye neftyanoy promyshlennosti Tatarstana i yego nauchnoye naslediye [Contribution of R.G. Abdulmazitov to the development of Tatarstan Oil Industry and its Scientific Heritage]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 174-192. DOI https://doi.org/10.25689/NP.2022.2.174-192. EDN ZPSNHR (in Russian)

DOI: https://doi.org/10.25689/NP.2022.2.193-200

EDN ZQWKQO

УДК 550.8

Professor G.E. Yakovlev is the creator of the scientific direction «Study of ecological and hydrogeological features of the upper part of the section by methods of geophysical research of wells» in the Republic of Tatarstan

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Abstract. Professor of Kazan University Gennady Evgenievich Yakovlev (1931 – 2015) is one of the representatives of the post-war pleiad of geophysicists of the Republic of Tatarstan, who made a significant contribution to the formation of the school of Kazan geophysicists and to the development of the Department of Geophysics of Kazan University, of which he was the head from 1980 to 1993. G.E. Yakovlev's theoretical and practical works in the field of electrometry of deep wells with large probes, providing increased depth of logging studies. The last period of scientific and pedagogical activity of G.E. Yakovlev was characterized by the creation of a new scientific direction for the Republic of Tatarstan related to logging studies of shallow wells opening the upper part of the geological section. As a result of fruitful activity, a "Methodological guide for logging hydrogeological wells" was created. The developed techniques and methodological approaches to logging of small wells in the geological conditions of the Republic of Tatarstan allow us to obtain valuable ecological and hydrogeological information by conducting effective logging of wells that open the upper part of the geological section.

Key words: *logging, elzh, well electrometry, GIS methods, hydrogeological tasks*

For citation: M.Y. Borovsky, V.I. Bogatov, A.S. Borisov, B.G. Chervikov, S.I. Petrov Professor G.E. Jakovlev – sozdatel' nauchnogo napravlenija «Izuchenie jekologo-gidrogeologicheskih osobennostej verhnej chasti razreza metodami geofizicheskih issledovanij skvazhin» v Respublike Tatarstan [Professor G.E. Yakovlev is the creator of the scientific direction «Study of ecological and hydrogeological features of the upper part of the section by methods of geophysical research of wells» in the Republic of Tatarstan]. Neftyanaya Provintsiya, No. 2(30), 2022. pp. 193-200. DOI https://doi.org/10.25689/NP.2022.2.193-200. EDN ZQWKQO (in Russian)