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ABSTRACTS

1 Study on Reservoir Forming Rules of Permian in Lukeqin-Yubei Area of Tuha Basin

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Abstract: The reservoir of Permian Wutonggou Formation was located in the footwall of famous Huoyanshan Belt, so it was urgently needed to investigate the reservoir forming mechanism of Permian to find out the favorable exploration areas in the next step. Therefore, the Permian reservoir-cap assemblages, the rule of reservoir growth, its microscopic characteristics, sedimentary characteristics, oil source correlation and rules of hydrocarbon migration and accumulation etc were studied, the rules of fault depressions controlling the oil source, Palaeostructure slopes controlling the oil and gas accumulation, sand bodies controlling the reservoir scale, and sedimentary microfacies controlling the oil production in the Permian Wutonggou Formation. Through in-depth research on geological conditions of Permian hydrocarbon accumulation, it is indicated from comprehensive analysis that in the south of Permian hydrocarbon generation depression in Taibei Sag, it has beneficial geologic conditions, such as close to oil source, Palaeo-nose uplift background, favorable sedimentary facies belt, and shallow depth, it is the prospective area for Permian oil and gas exploration, it is of significance for guiding progressive exploration of Permian oil and gas.

Key words: Wutonggou Formation; migration direction; hydrocarbon accumulation rule; fan delta; exploration direction

6 Study on the Sedimentary Environment and Sedimentary Facies of Benxi-Taiyuan Formation in Linxin Area in the Eastern Ordos Basin

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Abstract: Through sedimentary rock oxidation-parameter reduction, the sedimentary environment was judged. On the basis of the study, combined with drilling and core data, which was important for restoring and judgment of sedimentary. On that basis, the type of sedimentary facies of Benxi-Taiyuan Formation was judged. The integrated study shows that Benxi-Taiyuan Formation in the study area belongs to marine reduction environment, where the type of sedimentary facies is mainly of tidal flat facies, which is characterized by the microfacies of mudflat, sand flat and mixed flat.

Key words: eastern margin of Ordos Basin; carboniferous system; oxidation-reduction parameter; tidal flat facies.

10 Pore Structural Characteristics and Reservoir Classification and Evaluation of Extra-low Permeability Sandstone Reservoirs in the 4th Member of Xujiahe Formation of Northeast Sichuan Basin

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Abstract: The microscopic pore structure characteristics of tight sandstone reservoir was the key issue of exploration and development, as well as the main content of fine description and reservoir classification and evaluation of gas reservoirs. By using the data of conventional mercury injection, rock thin section, scanning electron microscope and, etc, the pore structural characteristics of ultra-low permeability sandstone reservoirs were studied in the 4th member of Xujiahe Formation of Northeastern Sichuan Area. The results showed that the main reservoir space of study area was dissolved inter-grain pores, dissolved intra-grain pores, residual intergranular pores and micro-cracks were the next. The main dissolution mineral types were feldspar, metamorphic lithic contents and interstitial material. The capillary pressure curves of T₃x₂ Reservoir Sandstones in the study area could be divided into three categories, such as the moderate displacement pressure-fine roar type, the higher displacement pressure-micro to fine roar type and the high displacement pressure-micro roar type. The value of porosity, sorting coefficient, the biggest mercury saturation were positive correlation with physical properties. Combined with typical parameters of pore throat characteristics, microscopic identification and porosity and permeability, the classification and evaluation criteria of ultra-low permeability tight sandstone reservoir are established in the study area.

Key words: pore structure; ultra-low permeability reservoir; reservoir classification and evaluation; Northeastern Sichuan; the 4th member of Xujiahe Formation

16 Carbonate Lithology Interpretation of Electrical Imaging Logging in Well Tuke1

Nian Tao, Wang Guiwen, Xiao Chengwen, Ran Ye, Liu Chao, Cui Yufeng, Li Zixian (First Author's Address: State Key Laboratory of Petroleum Resources and Prospecting (China University of Petroleum); College of Geosciences, China University of Petroleum, Beijing 102249, China)

Abstract: Borehole resistivity imaging logging reflected rock electrical properties. Its interpretation was based on the calibration of scattered and limited cores, it improved the interpreting accuracy of the borehole resistivity imaging logging. However core-shifting error and the similarities of rock fabrics restrained the interpretation accuracy which caused uncertainty of borehole images and the application of this technique. Well Tuke1 was the first outcrop well in Tarim Basin (drilled depth was 207m) which was drilled through Lianglitage, Tumuxiuke, Yijianfang and Yingshan Formations. In the well, successive coring (60~186.9m) and acquisition of logging data were carried out in Ordovician to set up a standard calibration well of outcrop, core and logging calibration. Logging acquisition included conventional loggings and microresistivity imaging logging, DSI, array laterolog and P-NMR. "Core-log" integration was prior to cores and casting thin sections evaluation on lithology interpretation for FMI and analyzing the micro-mechanism of image difference. This article clarifies the imaging features of micrite limestone, algal micrite limestone, bioclast limestone, calcarenite, organic frame limestone and bioclast micrite limestone. Thus, micrite limestone shows a regular strip feature, algal micrite limestone is depicted as a plastic feature, bioclast limestone shows a light and dark spot interaction, calcarenite is characterized as irregular strip and block features, organic frame limestone shows the light mottled feature and bioclast micrite limestone is a regular strip feature under the uneven color background.

Key words: imaging logging; outcrop well; continuous coring; lithologic interpretation; Tarim Basin; Well Tuke1

25 **Application of Pulsed Neutron Oxygen Activation Logging in Dual-tubing and Sectional Water Injection Wells**

Zhao Juntang (Author's Address: GWDC Wireline Services Company, PetroChina, Panjin 124011, Liaoning, China; Northeast Petroleum University, Daqing 163318, Heilongjiang, China)

Abstract: Because of heterogeneity of the reservoirs, uneven water absorbing profile was often induced, it was necessary to carry out waterflooding development by using dual-tubing separated layer waterflooding. The concentric dual-tubing separated water flooding could satisfy the requirement of précised injection in the injection wells with bigger variation in different zones, while pulsed neutron oxygen activation logging could determine water flow velocity and direction either in inner tubing, annulus of the dual-tubing, or casing-tubing annulus, and also it can determine the flow status of up and down flowing fluids. The process of pulsed neutron oxygen activation logging and dual-tubing separated layer water flooding tech are introduced in detail. By studying in logging and data processing pulsed neutron oxygen activation logging method and its interpretation method, the technique is effectively applied in dual-tubing separated layer water flooding.

Key words: pulsed neutron oxygen activation logging; separated water injection; dual-tubing

30 **Factory Operation Methods of Cluster Wells in Block Su 53 and Its Application**

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Abstract: Block Su 53 in Sulige Gas Field was characterized by tight reservoir, strong heterogeneity, small scale of effective sand body, low reserves abundance and low single well production. In order to improve the development efficiency and reduce development cost, factory development mode and refinement of management of large combinations of cluster wells were used, the operation program of drilling and fracturing was processed, batched and standardized. Innovations were implemented from the aspects of organization mode, resource allocation, process design, technical support and operations management. The existing resources and technological advantages were concentrated for professional and process operation. The optimized wellbore profile design, 3D wellbore trajectory control, optimization and application of PDC bits, sealing and leakage blocking, frictional control, wellbore stability, flat shift of the whole drilling unit, downhole accident prevention, drilling with hydroscillator are used for expediting the operation and shortening the production cycle, satisfying the needs of reducing the cost of exploration, a factory drilling and completion operation modes are established in the block, large-scale of development of low permeability, low production and low abundance gas fields is realized, a new model is established. for the efficient development of gas fields.

Key words: Block Su 53; cluster well; factory operation; horizontal well; batch drilling

35 **Remediation Technology for Reservoir Cementing for Screen Pipe Completion**

Tian Qizhong (Author's Address: Research Institute of Oil Engineering and Technology, Shengli Oilfield Company, SINOPEC, Dongying 257000, Shandong, China)

Abstract: In the cementing process of screen pipe completion, because of downhole tools and particular downhole situation, cement slurry would be leaked into the reservoir from screen pipe and reservoir was cemented. For reopen the reservoir, the acid washing string was set to the designed position by squeezing with cement sheath, the annulus between tubing and screen pipe was sealed with ce-

ment sheath, the outside sheath was broken by forward pressuring from tubing and the flushing valve was opened and reverse circulation path was established. The disintegrating slag and dirt of the broken outside sheath were carried out of the surface by acid flushing, the outside sheath could be broken and reversed flushing could be completed with acid fluid using one trip of string and perforating was not needed, that was, oil production path was established. Field test proves that the technology can shorten 5 weeks of operation intervals and greatly reduce the operation cost, it has obvious application effect and it can be popularized in oilfields.

Key words: screen; completion; cementing; reservoir; seal

39 **Oil Recovery Enhancement Technology for Reservoir with Edge and Bottom Water in Ng₆ of Gudong Oilfield**

Li Linxiang, Li Xiangtong (First Author's Address: Gudao Oil Production Plant, Shengli Oilfield Company, SINOPEC, Dongying 257231, Shandong, China)

Abstract: After water flooding development, the composite water cut and recovery percentage of Ng₆ in Gudong Oilfield have reached 96.3% and 44.8% respectively, which indicated that it has entered into limit water cut development stage. In order to further enhance oil recovery, the intralayer, interlayer and plane distribution characteristics of reservoir physical properties were finely described, the general distribution of remaining oil and distribution rules of its differential enrichment were analyzed. Based on the researches above, the following development adjustment technologies were studied: horizontal well is used to produce residual oil in interlayer, intensifying water injection is used in the plane to enhance oil production degree, injection-production parameters were optimized through numerical simulation. By setting up the development and adjustment scheme, the composite water cut of Ng₆ decreases by 49% compared to old wells, recoverable reserves increases by 7.6×10^4 t, and oil recovery enhances by 2.1%.

Key words: Gudong Oilfield; reservoir with edge and bottom water; remaining oil; oil recovery enhancement

43 **Analysis of Sensitive Parameters of Productivity for Horizontal Wells in Tight Gas Reservoirs of Sulige Gas Field Based on Multi-element Regression Method**

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Abstract: In allusion to the historical output of produced horizontal wells in tight gas reservoirs of Sulige Gas Field in Odors Basin, the sensitive parameters and their weight influencing production output were analyzed by regression analysis method, it provided an idea for optimizing the geologic and engineering parameters for improving the single well production of horizontal wells. By analyzing the characteristics of these parameters, the sensitive parameters influencing the production output were determined, unitary linear regressive analysis was performed on the sensitive parameters and a multi-element linear regressive model was established. Standardized regressive coefficient was used to check the influencing weight. The result indicates that the lateral continuity of the reservoirs is poor in the horizontal wells in Sulige Gas Field, the gas logging total hydrocarbon value while drilling can be used for more accurately evaluating the reservoir geologic parameters. Six engineering parameters and horizontal well's production are linear correlated with the production of horizontal wells. The weight for various parameters having interactive influence on horizontal well production is effective reservoir length > gas-bearing sandstone gas logging total hydrocarbon mean value > horizontal

length> stages> fluid volume> proppant. The sensitive parameters of horizontal well production obtained by multiple regression analysis method is reasonable and correct, and the development trend of further increasing the yield of horizontal wells should be improve drilling encounter rate, increase the contact area of reservoirs and improve the reservoir reconstruction volume.

Key words: multiple regression analysis; tight gas reservoir in Sulige Gas Field; production of horizontal well; sensitive parameter; linear correlation

50 **Application of Numerical Simulation in Tracking the Variation Characteristics of Residual Oil from Steam Driving and Steam Chamber**

Li Shengbiao (Author's Address: The 2nd Oil Production Plant, Henan Oilfield Company, SINOPEC, Nanyang 473400, Henan, Chian)

Abstract: The technology of thermal recovery by steam flooding was an important development method for heavy oil reservoirs. The heavy oil reservoirs in Henan Oilfield were characterized by "shallow, thin, heavy and disperse". In addition to the malpractice of steam overlapping and steam channeling, the residual oil distribution became more complicated after steam flooding. In order to study the distribution of residual oil and the change of steam chamber as well as to evaluate the results of steam flooding, 8 well groups in Fault Block 45 of Xin Zhuang Oilfield were selected for tracking analysis. Based on the fine description of 3D geological model of the target blocks, the whole process of steam flooding was tracked dynamically. Then, the variation characteristics of temperature and residual oil saturation were represented and the regulation of steam chamber changes and development was depicted. The steam injection of target layer and its flooding characteristics in the well group were also investigated. The results show that because of the influence of steam overlapping, perforation sequence and working system, the inter-well thermal communication and the expansion of steam chamber were higher in the 3rd Member of oil Formation II, where the range of steam sweep was wide with more development of steam chamber, compared with the 2nd Member of Oil Formation II. The formation of steam chamber was beneficial for the doubling of oil displacement efficiency and the obvious decrease of residual oil within its flooding scope. The spreading of the steam chamber had strong orientation due to the working system of the producers, heterogeneity of the reservoir and the flow resistance of the liquid. The study provides foundation for the adjustment of injection-production parameters in the steam flooding process and the subsequent application of enhanced-oil-recovery methods.

Key words: steam flooding; numerical simulation; residual oil distribution; steam chamber development; dynamic tracking

56 **The Current Situation and Prospect of the Sino-Russian East Pipeline Project**

Hu Siyue, Fu Qiang (First Author's Address: Hubei Geomatics Information Center, Wuhan 430074, Hubei, China)

Abstract: Based on the contract of Sino-Russian East Pipeline Project signed in May 2014 by China and Russia and the Chinese and Russian literature, the author used international cooperation theories, geo-political theories and political economic theories to mainly analyze the cooperative status quo, risks and development prospects of Sino-Russian East Pipeline Project.

Key words: China; Russia; East Pipeline Gas; international cooperation