1. Anchoring mechanical behavior of packer slips and its HTHP experimental analysis

Accession number: 20203509114405
Title of translation:
Authors: Han, Chuanjun (1); Peng, Xuefeng (1); Li, Lintao (2)
Author affiliation: (1) Key Laboratory of Oil and Gas Equipment, Ministry of Education, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Sinopec Northwest Oilfield Company, Urumqi; Xinjiang; 830011, China
Source title: Natural Gas Industry
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Publication year: 2020
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The setting performance of a packer is directly affected by the anchoring effect of a packer slip on the casing. When the slip is embedded into the casing, bite marks can be formed on the casing contact surface, and excessive embedded depth may lead to casing damage and failure. To ensure that slips perform a good packer fixing function while reducing the damage to the casing, this paper adopted the slip line theory, finite element analysis method and experimental method to study the mechanical behavior of slips in the process of anchoring and calculated the embedded depth of the slip in the casing. In addition, influences of slip thread angle, inclination angle, inner cone angle and axial load on the anchoring were analyzed, and structural parameters were optimized. And the following research results were obtained. First, the stress distribution on the casing contact surface is uneven, which results in stress concentration. Second, the stress of slip tooth decreases gradually as the number of teeth increases. Third, the embedded depth of the slip tooth in the casing increases with the increase of load, but decreases gradually with the increase of the number of teeth. Fourth, under the same load, the embedded depth of the slip in the casing decreases with the increase of thread angle and inner cone angle, but increases with the increase of inclination angle. Fifth, slip anchoring and packer setting experiment under high temperature and high pressure shows that the maximum embedded depth of the slip in the casing is between 0.40 mm and 0.45 mm. In conclusion, experimental results and finite element simulation results are better consistent, which verifies the correctness and reliability of the design and analysis.
Number of references: 18
Main heading: Finite element method
Controlled terms: Packers - Reliability analysis - Stress concentration
Uncontrolled terms: Design and analysis - Experimental analysis - Experimental methods - Finite element analysis method - Finite element simulations - High temperature and high pressure - Mechanical behavior - Structural parameter
Classification code: 511.2 Oil Field Equipment - 921.6 Numerical Methods
Numerical data indexing: Size 4.00e-04m to 4.50e-04m
DOI: 10.3787/j.issn.1000-0976.2020.07.009
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

2. Genealogy construction of oil & gas exploration and development technological products in China

Accession number: 20202908937811
Title of translation:
Authors: Jiang, Zi'ang (1); Gu, Sui (1); Wang, Jing (1); Ren, Limei (2); Liu, Weidong (3); Peng, Bin (4); Ma, Yingkai (1)
Author affiliation: (1) Natural Gas Economic Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Tight Oil & Gas Exploration and Development Project Division, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (3) Communications and Information Technology Center, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (4) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China

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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 149-156
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The technological processes and systems of oil & gas exploration and development industry are complex in structure, huge in quantity and great in investment risk. The basic work of technological resource management is weak, so technological rank order and function empowerment have been the bottlenecks of single technological value assessment, which seriously restricts both technological value evaluation and technological development strategy implementation in this industry. Based on genealogical theories and thoughts, this paper constructed the rank order and quantity genealogy of oil & gas exploration and development technology under the guidance of technological valuation and commercialization. Then, natural gas exploration and development technology was taken as an example to design and construct the rank order genealogy of natural gas exploration and development technology in the pattern of 5n geometric series and four rank orders. And the following research results were obtained. First, genealogical development of oil & gas technologies will be an inevitable trend of oil & gas technological resource management. Second, the construction of oil & gas technological product genealogy is a basic relationship index for describing the technological system and its rank order, and it is also a tool for sharing technological innovation achievements effectively and a key tool for verifying the share percentage of technological innovation achievements. Third, deeply exploring the construction of oil & gas technological genealogy will be conducive to expanding the popularization, application and market development of oil & gas technologies and promote the valuation of technological innovation achievements. In conclusion, the technological product genealogy constructed in this paper can not only describe the whole natural gas exploration and development technology system and the basic energy-level relationship between the technologies and realize the resource matching between technological innovation and technological market, but find out the basic function "positions" of innovative technologies to deal with technological innovation and efficiency capacity empowerment, share radix and other problems. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 19
Main heading: Petroleum prospecting
Controlled terms: Commerce - Gas industry - Gases - Geological surveys - History - Investments - Natural gas - Natural gas deposits - Natural resources management - Resource allocation
Uncontrolled terms: Innovative technology - Natural gas exploration - Product genealogies - Technological development - Technological innovation - Technological process - Technological resources - Technological system
Classification code: 481.1 Geology - 512.1.2 Petroleum Deposits : Development Operations - 512.2 Natural Gas Deposits - 522 Gas Fuels - 912.2 Management - 971 Social Sciences
DOI: 10.3787/j.issn.1000-0976.2020.06.016
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

3. New discovery of sandy debris flow sandbody and its implications for oil and gas exploration in the Junggar Basin

Accession number: 20205209693541
Title of translation:
Authors: Hou, Gangfu (1); Zeng, Delong (2); Niu, Zhijie (2); Wang, Libao (1); Song, Bing (1); Guo, Huajun (1); Shan, Xiang (1); Dou, Yang (1); Li, Yazhe (1); Peng, Bo (1)
Author affiliation: (1) PetroChina Hangzhou Institute of Geology, Hangzhou; 310023, China; (2) Exploration and Development Research Institute, PetroChina Xinjiang Oilfield Company, Karamay; 834000, China
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Publication year: 2020
Pages: 41-49
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to find out whether effective sand bodies are developed and lithologic traps are ascertained in the sag areas of the Junggar Basin, this paper analyzes the paleogeomorphology, sedimentary microfacies, reservoir property and petroliferous property of the second Member of Lower Jurassic Sangonghe Formation in the western Well Pen-1 sag of the Junggar Basin by means of core observation, heavy mineral analysis, reservoir characterization and seismic reflection characteristics analysis. Then, the lithologic trap conditions of sandy debris flow sandbody are evaluated. Finally, the direction of next natural gas exploration in the Sangonghe Formation of the Junggar Basin is pointed out. And the following research results were obtained. First, in the second Member of Sangonghe Formation around the western Well Pen-1 sag develops a slope break belt, above which a delta front sandbody is developed. Under the trigger of Yanshanian tectonic activity, the semi-deep lake slumping below the slope break belt develops into a sandy debris flow sandbody. Second, the sandy debris flow sandbody is thick. It vertically has a structure of "sandstone in mudstone" and laterally is separated from the sandbody of front facies through a muddy belt. Therefore, its sealing conditions are better and lithologic trap conditions are favorable. Third, the sandy debris flow sandbody has good reservoir physical properties and is classified into the category of moderate-better reservoir. And its petroliferous property is overall better. In conclusion, a sandy debris flow sandbody is developed in the Sangonghe Formation of the Junggar Basin. It has favorable lithologic trap conditions and is of great significance to oil and gas exploration. In addition, a great breakthrough of oil and gas exploration is realized by drilling new wells, on the basis of the research results. It is confirmed that the sandy debris flow sandbody below the slope break belt has favorable conditions for the formation of lithologic oil and gas reservoirs and it is the most favorable new field of next natural gas exploration in this area. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 32
Main heading: Petroleum prospecting
Controlled terms: Debris - Gases - Gasoline - Geological surveys - Landforms - Minerals - Natural gas - Natural gas fields - Oil well drilling - Petroleum reservoir engineering - Petroleum reservoirs
Uncontrolled terms: Favorable conditions - Natural gas exploration - Oil and gas exploration - Oil and gas reservoir - Reservoir characterization - Reservoir physical property - Sedimentary micro-facies - Seismic reflection characteristics
Classification code: 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 523 Liquid Fuels
DOI: 10.3787/j.issn.1000-0976.2020.11.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

4. Delineation of hot dry rock exploration target area in the Gonghe Basin based on high-precision aeromagnetic data

Accession number: 20205009619814
Title of translation:
Authors: Zhang, Senqi (1); Fu, Lei (1); Zhang, Yang (1); Song, Jian (1); Wang, Fuchun (2); Huang, Jinhui (3); Jia, Xiaofeng (1); Li, Shengtao (1); Zhang, Linyou (1); Feng, Qingda (1)
Author affiliation: (1) Center for Hydrogeology and Environmental Geology Survey, China Geological Survey, Baoding; 071051, China; (2) Qinghai Geological Survey, Xining; 810008, China; (3) Geophysical Exploration Academy of China Metallurgical Geology Bureau, Baoding; 071051, China
Corresponding author: Song, Jian(songjian5596@126.com)
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020

Pages: 156-169
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Concealed granite masses developed in sedimentary basins are the main objects for the exploration and development of hot dry rocks. In order to analyze the distribution laws of the concealed granite masses in the Gonghe Basin, Qinghai, this paper delineated the exploration target areas of hot dry rocks in this area. Then, based on the inverse calculation result of high-precision aeromagnetic survey data (1: 50 000), the distribution laws of the concealed granite masses in the Gonghe Basin were analyzed by comprehensively considering the topographic, geomorphologic and hydrologic geological conditions, the distribution area and cybotaxis of concealed granite masses and the sedimentary thickness of cap rocks in this area. Finally, fifteen exploration target areas of concealed hot dry rocks were delineated in the aeromagnetic survey area, including thirteen in the Gonghe Basin, one in the Qinghai Lake Basin and one in the Tongde Basin. And the following conclusions were reached. First, comprehensive geophysical exploration and drilling results show that the concealed Indosinian intermediate-acid granite mass which is delineated in Qiabuqia area is a hot dry rock mass. It is indicated that high-precision aeromagnetic survey is applicable to the preliminary exploration and target area delineation of regional hot dry rocks. Second, the main part of the concealed Indosinian magnetic granite mass is distributed along NW in the form of band, which is basically accordant with the distribution direction of the regional concealed faulted structure. And some irregular concealed Indosinian magnetic granite masses are mainly located in the west of Gonghe County, and they are distributed approximately along NE striking Sairiqin-Dalianhai concealed fault. Third, Sairiqin-Dalianhai concealed fault and Tangnaihai-Luohantang concealed fault act as the main upwelling pathway of deep-seated heat flow in the east and the west of the Gonghe Basin, respectively, and they are in a close relationship with the genesis of hot dry rocks. Fourth, in the direction of east-west, the burial depth of the concealed granite masses increases gradually from the delineated Qiabuqia hot dry rock in the east to the west. And in the direction of north-south, the burial depth of the concealed granite masses presents an increasing trend from the northern and southern margins to the center of the basin. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 47
Main heading: Granite
Controlled terms: Sedimentary rocks - Sedimentology - Surveys
Uncontrolled terms: Aeromagnetic data - Aeromagnetic surveys - Distribution area - Exploration and development - Exploration targets - Geological conditions - Geophysical exploration - Inverse calculation
Classification code: 481.1 Geology - 482.2 Minerals
DOI: 10.3787/j.issn.1000-0976.2020.09.019
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

5. Genetic mechanism of high-quality shale gas reservoirs in the Wufeng-Longmaxi Fms in the Sichuan Basin

Accession number: 20202908937849
Title of translation: -
Authors: Nie, Haikuan (1, 2, 3); He, Zhiliang (1, 2, 4); Liu, Guangxiang (1, 2, 3); Du, Wei (1, 2, 3); Wang, Ruyue (1, 2, 3); Zhang, Guangrong (5)
Author affiliation: (1) State Key Laboratory of Shale Oil & Gas Enrichment Mechanisms and Effective Development, Beijing; 100083, China; (2) Sinopec Key Laboratory of Shale Oil/Gas Exploration & Production, Beijing; 100083, China; (3) PetroChina Research Institute of Petroleum Exploration & Production, Beijing; 100083, China; (4) Department of Science and Technology, China Petroleum & Chemical Corporation, Beijing; 100728, China; (5) School of Energy Resource, China University of Geosciences, Beijing; 100083, China
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Publication year: 2020
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Language: Chinese

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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Upper Ordovician Wufeng Formation and the Lower Silurian Longmaxi Formation are important strata for shale gas exploration and development in the Sichuan Basin, but the genetic mechanism, evolutionary history and the controlling effect of mineral diagenetic evolution on the formation of shale gas reservoirs are not clear. In this paper, the evolution history of organic matter pores and the diagenetic evolution of minerals were analyzed based on the analysis of petrology, mineralogy and organic geochemistry, combined with basin simulation and practical shale gas exploration and development. Then, the types and genetic mechanisms of high-quality shale gas reservoirs were discussed, and the development intervals of high-quality shale gas reservoirs were determined. And the following research results are obtained. First, the shale gas development intervals of Wufeng-Longmaxi Fm in the Sichuan Basin are mainly dominated by siliceous shale, limy siliceous shale and clay shale. Rock type has an important controlling effect on the types and characteristics of shale reservoir space. Siliceous shale and limy siliceous shale have the highest reservoir capacity with the most developed organic pores. Second, the diagenetic evolution of minerals controls the formation of shale gas reservoirs. Biogenic silicon, was formed in the early diagenetic stage, together with terrestrial detrital silicon and pyrite, constitutes particle support lattices in the form of microcrystalline aggregates, so as to resist the compaction effectively and preserve a great number of residual intergranular pores, which is beneficial to the formation of high-quality shale gas reservoirs. Third, siliceous shale in the WF2-LM4 graptolite zone (from Wufeng Formation to the bottom of Longmaxi Formation) presents a high-quality reservoir genetic mechanism of "multicellular algae controlling hydrocarbon source, biogenic silicon controlling framework, and co-evolution controlling a high-quality reservoir". In conclusion, the siliceous shale and limy siliceous shale in the WF2-LM4 graptolite zone are the main development intervals of high-quality shale gas reservoirs.
Number of references: 42
Main heading: Quality control
Controlled terms: Gases - Geochemistry - Geological surveys - Microcrystals - Mineral exploration - Organic minerals - Petroleum prospecting - Petroleum reservoirs - Pyrites - Shale gas - Textures
Uncontrolled terms: Diagenetic evolution - Evolutionary history - High quality reservoir - Hydrocarbon sources - Intergranular pores - Organic geochemistry - Reservoir capacity - Shale gas reservoirs
Classification code: 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals - 501.1 Exploration and Prospecting Methods - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 913.3 Quality Assurance and Control - 933.1 Crystalline Solids
DOI: 10.3787/j.issn.1000-0976.2020.06.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

6. Study on the drilling safety probability interval in narrow pressure window formation in deepwater HPHT gas fields

Accession number: 20210309770802
Title of translation:
Authors: Li, Zhong (1); Xie, Renjun (1); Yuan, Junliang (1)
Author affiliation: (1) CNOOC Research Institute Co., Ltd., Beijing; 100028, China
Corresponding author: Yuan, Junliang(yuan6688699@163.com)
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 88-94
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency

Abstract: In order to quantitatively evaluate the risk probability of a would-be-drilled well in the predrilling stage, this paper established the probability density function of the equivalent density of formation pore pressure and fracture pressure based on Mode-C model by taking the measured formation pore pressure and fracture pressure of the Paleogene Huangliu Formation in a certain high temperature and high pressure (HPHT) gas field in the Yingqiong Basin of western South China Sea as the samples. Then, the safe drilling probability of directional wells with different azimuths and deviation angles in the strata with narrow window was determined. And the following research results were obtained. First, the frequency distribution of the equivalent density of formation pore pressure and fracture pressure of the Huangliu Formation reservoir in the case gas field is in the form of left skewness. The probability of the equivalent density of formation pore pressure lower than 2.28 g/cm3 is 85% and the probability of the equivalent density of fracture pressure lower than 2.30 g/cm3 is 15%. Second, as for vertical wells, the probability of safe drilling is 60% when the conventional drilling technology is adopted to keep the equivalent density of bottom hole pressure in the range of 2.25-2.35 g/cm3 with a fluctuation amplitude of 0.1 g/cm3, and it is 85% when the managed drilling technology is applied to control the fluctuation amplitude below 0.02 g/cm3. Third, as for development wells with a deviation angle of 45°, the safe drilling probability is 45% when the equivalent density of bottom hole pressure is kept in the range of 2.23-2.33 g/cm3 with a fluctuation amplitude of 0.1 g/cm3, and it is 75% when the managed drilling technology is applied to control the fluctuation amplitude below 0.02 g/cm3. Fourth, as for horizontal wells with a deviation angle of 90°, the probability of safe drilling is 30% when the equivalent density of bottom hole pressure is kept in the range of 2.18-2.28 g/cm3 with a fluctuation amplitude of 0.1 g/cm3, and it is 55% when the managed drilling technology is applied to control the fluctuation amplitude below 0.02 g/cm3. Fifth, the proposed method is only applicable to the regional overall prediction instead of the risk prediction of a single well to be drilled. Sixth, as for a specific single well, it is necessary to dynamically predict the depth and pressure window of the lower key formations, optimize the casing program in real time and adjust the casing setting depth using the VSP formation interval velocity inversion technology and the forward looking technology while drilling, based on predrilling seismic and geological data, drilling and logging data of its neighboring wells and logging while drilling of the target well, so as to increase the probability of safe drilling greatly.
Number of references: 23
Main heading: Logging while drilling
Controlled terms: Angle measurement - Boreholes - Bottom hole pressure - Deepwater drilling - Forecasting - Fracture - Horizontal wells - Infill drilling - Offshore gas fields - Pore pressure - Pressure control - Probability density function - Risk assessment - Seismic prospecting
Uncontrolled terms: Conventional drilling - Drilling technology - Fluctuation amplitudes - Formation pore pressure - Frequency distributions - High temperature and high pressure - Probability intervals - Western south china seas
Classification code: 481.4 Geophysical Prospecting - 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 731.3 Specific Variables Control - 914.1 Accidents and Accident Prevention - 922.1 Probability Theory - 943.2 Mechanical Variables Measurements - 951 Materials Science
Numerical data indexing: Mass_Density 1.00e+02kg/m3, Mass_Density 2.00e+01kg/m3, Mass_Density 2.18e+03kg/m3 to 2.28e+03kg/m3, Mass_Density 2.23e+03kg/m3 to 2.33e+03kg/m3, Mass_Density 2.25e+03kg/m3 to 2.35e+03kg/m3, Mass_Density 2.28e+03kg/m3, Mass_Density 2.30e+03kg/m3, Percentage 1.50e+01%, Percentage 3.00e+01%, Percentage 4.50e+01%, Percentage 5.50e+01%, Percentage 6.00e+01%, Percentage 7.50e+01%, Percentage 8.50e+01%
DOI: 10.3787/j.issn.1000-0976.2020.12.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

7. Development characteristics and genesis of secondary high porosity zones in deep clastic reservoirs: A case study of the Lower Jurassic in the Taibei Sag of the Tuha Basin

Accession number: 20205209693476
Title of translation: -
Authors: Hao, Aisheng (1, 2); Li, Jian (1, 2); Guo, Jianying (1, 2); Ran, Qigui (1); Zhang, Hua (3); Qi, Xuening (1, 2); Wu, Hao (4); Jia, Xueli (3); Huang, Diefang (3); Chen, Xuan (3); Kang, Jilun (3); Shi, Yanjun (5)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100011, China; (2) CNPC Key Laboratory of Natural Gas Reservoir Formation and Development, Langfang; 065007, China; (3) Exploration and Development Research Institute, PetroChina Tuha Oilfield Company, Hami; 839009, China; (4) School of Earth Sciences, Lanzhou University, Lanzhou; 730000, China; (5) No.2 Drilling Engineering Company, CNPC Bohai Drilling Engineering Co., Ltd., Langfang; 065000, China
Corresponding author: Wu, Hao(haowu@lzu.edu.cn)
Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 50-59
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The distribution laws of the favorable Lower Jurassic deep clastic reservoirs in the Tuha Basin are not understood clearly, which seriously restricts the large-scale oil & gas exploration and development in this basin. In order to clarify the distribution laws of the favorable Lower Jurassic deep clastic reservoirs in the Taibei sag of the Tuha Basin, this paper studies the development characteristics of the high porosity zones in the Lower Jurassic deep layer and discusses their genesis by using the data of measured petrophysical property, physical property by logging interpretation, casting thin section and scanning electron microscope, after analyzing the basic characteristics of the reservoirs and the evolution of primary pores. And the following research results were obtained. First, the lithology of the Lower Jurassic reservoir is mainly feldspathic litharenite and litharenite with moderate compositional maturity and textural maturity, and the burial depth is in a better logarithmic function relationship with the normal maximum primary porosity. Second, under the background of low-porosity and low-permeability of the Lower Jurassic reservoir, two kinds of favorable reservoirs are developed, i.e., normally evolving high porosity reservoir and secondary high porosity reservoir. In plane, these two types of reservoirs are mainly distributed in the Huoyanshan, Pubei and Shanshan arc structural belts. Third, the porosity and permeability of the secondary high porosity reservoir are in a range of 10-15% and 1.0-10.0 mD, respectively. The percentage of primary pores in the reservoirs is 60.5-90.0%, averaging 81.5%. Fourth, two secondary high porosity zones are developed at the depth of 4 000-4 300 m and 4 450-4 550 m in the secondary high porosity reservoir. Fifth, the weakly compacted and consolidated coarse sandstone and glutenite which have high quartzose clastic content and are developed in underwater distributary channels and mouth bars of braided river delta front provide the material base for the formation of deep secondary high porosity zones, and porosity increase due to the dissolution of organic acid is the genetic mechanism for the development of deep secondary high porosity zones. In conclusion, the secondary high porosity reservoir below 4 000 m and the normally evolving high porosity reservoir are the new fields of deep oil and gas exploration in the Taipei sag of the Tuha Basin.
Number of references: 35
Main heading: Oil well logging
Controlled terms: Geological surveys - Lithology - Low permeability reservoirs - Petroleum prospecting - Petroleum reservoir engineering - Porosity - Scanning electron microscopy
Uncontrolled terms: Basic characteristics - Casting thin sections - Development characteristics - Logarithmic functions - Logging interpretation - Oil and gas exploration - Petrophysical properties - Underwater distributary channels
Classification code: 481.1 Geology - 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Percentage 1.00e+01% to 1.50e+01%, Percentage 6.05e+01% to 9.00e+01%, Percentage 8.15e+01%, Size 4.00e+03m, Size 4.00e+03m to 4.30e+03m, Size 4.45e+03m to 4.55e+03m
DOI: 10.3787/j.issn.1000-0976.2020.11.006
Compendex references: YES
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8. A new well test interpretation model for complex fracture networks in horizontal wells with multi-stage volume fracturing in tight gas reservoirs

Accession number: 20201708556857
Title of translation:
Authors: Ouyang, Weiping (1); Sun, Hedong (2); Han, Hongxu (3)
Author affiliation: (1) Changqing Downhole Technology Company, CNPC Chuanqing Drilling Engineering Co., Ltd., Xi'an; Shaanxi; 710018, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (3) Project Supervision Department, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China

Corresponding author: Sun, Hedong(sunhed@petrochina.com.cn)
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Issue: 3
Issue date: March 25, 2020
Publication year: 2020
Pages: 74-81
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Multi-stage volume fracturing of horizontal wells is the main means to develop tight gas reservoirs. Complex fracture networks of various shapes are generated around the wellbore after volume fracturing. At present, however, most of the well test models suitable for fracturing horizontal wells take all hydraulic fractures as single main fractures, which results in a large error between well test interpretation result and actual situation. As a result, the fracture network characteristic parameters of the stimulated areas cannot be obtained accurately. To this end, a well test model for complex fracture networks in tight-gas fracturing horizontal wells was established on the basis of the non-structural discrete fracture model. Then, this model was solved by using the finite element method with combined triangular elements and linear elements. And accordingly, the well test type curves of a horizontal well under different fracture network patterns (rectangular, elliptical and hyperbolic) were prepared. Based on this, well test type curves were analyzed from the aspects of characteristics and influential factors and were compared with those obtained from the conventional single-fracture model. Finally, the new model was applied in well test interpretation of one multi-stage volume fracturing horizontal well in the gas reservoir of Permian Shan 1 Member in the Qingyang Gas Field of the Ordos Basin. And the following research results were obtained. First, the biggest difference of well test type curve between the fracture network model and the conventional single-fracture model occurs in the early stage, the characteristics of first linear flow regime are replaced with the characteristics of pseudo-radial flow regime in the stimulated area. Second, the end time of the pseudo-radial flow regime in the stimulated area is mainly dominated by the size and shape of the stimulated area. The larger the stimulated area is, the longer the pseudo-radial flow regime lasts. As the shape of the stimulated area approaches to be elongated, the characteristics of the well test type curve obtained by the new model are more consistent with those by the single-fracture model. Third, the pressure derivative value of the pseudo-radial flow regime in the stimulated area is mainly dependent on the conductivity and density of the fracture network. The higher the density or the conductivity of fracture network in the stimulated area is, the earlier the wellbore storage effect regime ends, the lower the pressure derivative value of the pseudo-radial flow regime in the stimulated area is and the more obvious the characteristics of the horizontal line are. In conclusion, case study results confirm that the new model is reliable and practical and can provide accurate reservoir parameters as well as the size of the effectively stimulated area by volume fracturing and the conductivity of fracture network, which is conducive to evaluating the stimulation effect of volume fracturing and predicting the postfrac production performance. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 27
Main heading: Horizontal wells
Controlled terms: Boreholes - Complex networks - Fracture - Gases - Oil field equipment - Petroleum reservoirs - Radial flow - Tight gas - Well stimulation - Well testing
Uncontrolled terms: Discrete-fracture models - Fracture network models - Production performance - Reservoir parameters - Tight gas reservoirs - Well test interpretation - Well test type curves - Wellbore storage effects
Classification code: 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 522 Gas Fuels - 631.1 Fluid Flow, General - 722 Computer Systems and Equipment - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.03.009
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

9. Discovery of Well Bozi 9 and ultra-deep natural gas exploration potential in the Kelasu tectonic zone of the Tarim Basin

Accession number: 20200908220944
Title of translation: 9
Authors: Tian, Jun (1); Yang, Haijun (2); Wu, Chao (2); Mo, Tao (2); Zhu, Wenhui (2); Shi, Lingling (2)

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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Bozi-Dabei Block in the west of the Kelasu tectonic zone in the Tarim Basin is a complex tectonic zone which is characterized by ultra depth, high temperature, ultra high pressure, violent structural deformation and low oil and gas exploration degree. In Well Bozi 9 which is a wildcat well drilled in the Bozi-Dabei Block, a breakthrough has been made recently with a high-yield industrial oil and gas flow produced during a fracturing test. In order to speed up the oil and gas exploration in this block, this paper analyzed the controlling effect of fault grading combination and paleo-structure on structural deformation in the Kelasu tectonic zone. Then, provenance, stress field and hydrocarbon accumulation characteristics of Bashijiqike Formation and Baxigai Formation of Lower Cretaceous were investigated. Finally, the natural gas exploration potential was evaluated. And the following research results were obtained. First, there are four first-order faults in the Kelasu tectonic zone, including Bozi-Kela, Kelasu, Keshen and Baicheng, which form and control four fault tectonic belts. Second, in the west of this tectonic zone develop two paleo-structures (Bozi and Dabei), which began in the Early Cretaceous and five structural models are formed. Third, two sets of sandstone reservoirs of Bashijiqike Formation and Baxigai Formation are developed in the Kelasu tectonic zone. The former is an ultra-deep (7 500 m) quality reservoir, which is under the control of coarse lithology, weak compaction and low stress. The latter is mainly located in the second member and classified as a fractured-porous reservoir of braided river delta front. Fourth, the crude oil in the west of the Kelasu tectonic zone is originated from the source rocks of the Qiakemake Formation of Middle Jurassic, and it underwent two stages of hydrocarbon accumulation, i.e., "oil accumulation in the early stage of and gas accumulation in the late stage". The dry gas in the east is mainly derived from the source rocks of the Huangshanjie Formation of Upper Triassic in the pattern of one-stage hydrocarbon accumulation. In this way, the hydrocarbon accumulation characteristics of dry gas in the east and condensate gas in the west are formed. In conclusion, a favorable trap with natural gas resources of more than a trillion cubic meters is developed in the Bozi-Dabei Block, a series of gas reservoirs with resources of hundreds of billions cubic meters (e.g. Bozi 9) have been discovered and oil and gas breakthroughs have been realized continuously. In addition, the Bozi-Dabei major gas area with resources of one trillion cubic meters will be implemented in the near future.
Number of references: 22
Main heading: Discovery wells
Controlled terms: Deformation - Energy resources - Faulting - Flow of gases - Gases - Geological surveys - Grading - Hydrocarbons - Lithology - Natural gas - Natural gas wells - Oil well drilling - Oil well testing - Petroleum prospecting - Petroleum reservoirs - Quality control - Reservoirs (water) - Wildcat wells
Uncontrolled terms: Bozi-Dabei Block - Early Cretaceous - Natural-gas accumulation - Tarim Basin - Trap - Ultra deeps
Classification code: 441.2 Reservoirs - 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 631.1.2 Gas Dynamics - 804.1 Organic Compounds - 913.3 Quality Assurance and Control
Numerical data indexing: Size 7.50e+03m
DOI: 10.3787/j.issn.1000-0976.2020.01.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

10. Deep and ultra-deep natural gas exploration in the Sichuan Basin: Progress and prospect

Accession number: 20202508844925
Title of translation: -

Authors: Guo, Xusheng (1); Hu, Dongfeng (1); Huang, Renchun (1); Wei, Zhihong (1); Duan, Jinbao (1); Wei, Xiangfeng (1); Fan, Xiaojun (1); Miao, Zhiwei (1)
Author affiliation: (1) Sinopec Exploration Company, Chengdu; Sichuan; 610041, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: May 25, 2020
Publication year: 2020
Pages: 1-14
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, major breakthroughs have been made in natural gas exploration in deep and ultra-deep strata in the Sichuan Basin, but the overall successful rate is low. To further clarify the prospects there, it is necessary to make an in-depth analysis of the previously discovered large-scale reef-shoal gas fields such as Puguang, Yuanba, Anyue and Longgang and deep shale gas discovery in Dingshan and Dongxi, southern Sichuan Basin. On one hand, large high-energy facies are the basis for controlling the development of large-scale reef-shoal reservoirs in conventional reef-shoal areas. The reservoir original porosity is high. The atmospheric freshwater dissolution in the early diagenetic stage, dolomitization, unconformity karst, and "pore-fracture coupling" mainly control the development of secondary pores. The contribution of hydrothermal fluids to reservoir is double-sided, and such early pores can be preserved till present due to those retention processes such as early hydrocarbon charging. Apart from continuous preservation as the key factor, most gas reservoirs are featured by "near-source enrichment, phase transformation, and dynamic adjustment". On the other hand, deep shale gas generally has the characteristics of "high pressure, high porosity, and high gas content", that is, "overpressure and rich gas". The key to the development of high-quality deep shales with high pores are "quartz compression retaining hole" and "reservoir fluid overpressure". The weak tectonic effect in the late stage is the main reason for deep shale gas to maintain the "high pressure and high gas content". In conclusion, technological advances like geological target identification and "sweet spot" prediction, as well as deep, high-temperature and high-pressure engineering processes, are the guarantee for efficient exploration of conventional and unconventional deep and ultra-deep natural gas, which has great potential in the Sichuan Basin. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 44
Main heading: Petroleum prospecting
Controlled terms: Gases - Geological surveys - High pressure effects - High pressure engineering - High temperature engineering - Natural gas - Natural gas wells - Petroleum reservoirs - Porosity - Reefs - Shale gas
Uncontrolled terms: Atmospheric freshwater - Dynamic adjustment - Engineering process - High temperature and high pressure - Hydrothermal fluids - Natural gas exploration - Target identification - Technological advances
Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.05.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

11. New understandings and potential of Sinian-Lower Paleozoic natural gas exploration in the central Sichuan paleo-uplift of the Sichuan Basin

Accession number: 20203509114488
Title of translation: -
Authors: Xu, Chunchun (1); Shen, Ping (1); Yang, Yueming (1); Zhao, Luzi (1); Luo, Bing (2); Wen, Long (2); Chen, Kang (2); Ran, Qi (2); Zhong, Yuan (2); Peng, Hanlin (2)
Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40

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Issue date: July 25, 2020
Publication year: 2020
Pages: 1-9
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Since the Anyue Gasfield, located in the central Sichuan paleo-uplift of the Sichuan Basin, was discovered, great efforts have been made to work on natural gas exploration and discovery in the Sinian-Lower Paleozoic in the north slope of present paleo-uplift which has similar depositional settings. It is verified by the breakthrough of natural gas exploration in the second Member of Upper Sinian Dengying Formation in the north slope of central Sichuan paleo-uplift by wildcat well PT1 and the new sign of natural gas exploration in the Can-glangpu Formation of Lower Cambrian and the fourth Member of Dengying Formation by Well JT1 that there are also favorable conditions for the formation of large-scale gas province in the north slope. In order to determine the natural gas exploration potential of Sinian-Lower Paleozoic in the central Sichuan paleo-uplift and provide the guidance for the following exploration deployment, this paper analyzed the petroleum geological conditions of Sinian-Lower Paleozoic in the north slope. And the following research results were obtained. First, the marginal platform belts in the second and the fourth Member of Sinian Dengying Formation in the north slope are basically separated areally, and they are superior to the Gaomo area in terms of marginal platform width and sedimentary thickness and are intrinsically advantageous in sedimentation. Second, compared with the Gaomo area, the reservoirs of Sinian Dengying Formation in the north slope are better in reservoir conditions, and many sets of quality reservoirs are developed vertically in Sinian-Cambrian. Third, hydrocarbon accumulation elements of Sinian Dengying Formation are better allocated in the north slope. Lithological traps are developed with a larger cumulative area. Wells JT1 and PT1 verify that there is gas in the lithological trap of the fourth and the second Member of Dengying Formation and large-scale lithological gas reservoirs are developed in the slope setting. In conclusion, compared with the Gaomo area, the Sinian-Lower Paleozoic in the north slope is superior in petroleum geological conditions and has the advantage of multi-layer stereoscopic exploration vertically, presenting a great natural gas exploration potential and promising exploration prospects, so it is a new important strategic zone of conventional natural gas exploration in the Sichuan Basin.
Number of references: 17
Main heading: Petroleum prospecting
Controlled terms: Gases - Gasoline - Geological surveys - Lithology - Natural gas - Natural gas wells - Petroleum geology - Petroleum reservoirs - Stereo image processing - Wildcat wells
Uncontrolled terms: Dengying formation - Depositional setting - Exploration prospects - Favorable conditions - Geological conditions - Hydrocarbon accumulation - Natural gas exploration - Reservoir conditions
Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 522 Gas Fuels - 523 Liquid Fuels - 723.2 Data Processing and Image Processing
DOI: 10.3787/j.issn.1000-0976.2020.07.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

12. Annulus pressure management of marine deepwater HTHP gas wells

Accession number: 20201208318043
Title of translation:
Authors: Luo, Ming (1, 2); Gao, Deli (1); Li, Wentuo (2); Zhang, Chao (2); Yang, Yuhao (2); Deng, Wenbiao (2)
Author affiliation: (1) MOE Key Laboratory of Petroleum Engineering, China University of Petroleum, Beijing; 102249, China; (2) CNOOC China Limited Zhanjiang Branch, Zhanjiang; Guangdong; 524057, China
Corresponding author: Li, Wentuo(liwt6@cnooc.com.cn)
Source title: Natural Gas Industry
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Pages: 115-121
Language: Chinese

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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The problem of annulus pressure is prominent in the development process of high-temperature and high-pressure (HTHP) oil and gas reservoirs in the South China Sea. And once the annulus pressure exceeds the allowable value, the safety of production will be impacted. Therefore, it is necessary to determine the range of reasonable annulus pressure in order to ensure the normal production of gas wells. Based on the recommended practice in ISO 16530-1:2017 and API RP 90-2, this paper researched and established a model for calculating the annulus pressure control value of deepwater HTHP gas wells while considering the pressure bearing capacity of pipe string and the check of key nodes, as well as a set of annulus pressure management chart. And the following research results were obtained. First, the calculation of the pressure bearing capacity of pipe string is mainly aimed at the tubing and casing corresponding to annulus. Second, the check calculation of key nodes mainly focuses on wellhead device, packer, downhole safety valve and liner hanger. Third, a model for calculating the minimum reserved annulus pressure is established to apply a certain backup pressure in the annulus of the deepwater gas wells with high formation pressure and that with high bottom hole flow pressure and ensure the normal operation of downhole strings and tools in the range of reasonable annulus pressure. Fourth, the calculation and analysis are carried out by taking one deepwater well as an example. The control values of annulus pressure with the change of commissioning time with and without considering the reduction of wall thickness are obtained. It is concluded that the proposed model and chart are simple and can be operated easily when they are used in marine deepwater HTHP gas wells, and they provide reference for annulus pressure management of deepwater HTHP wells and similar wells.
Number of references: 19
Main heading: Reservoir management
Controlled terms: Bearing capacity - Gas industry - Gases - Offshore gas fields - Offshore gas well production - Offshore gas wells - Oil field equipment - Petroleum reservoir engineering - Pressure control - Tubing - Wellheads
Uncontrolled terms: Annulus pressures - Control values - Deepwater - High temperature and high pressure - South China sea
Classification code: 511.2 Oil Field Equipment - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 731.3 Specific Variables Control
DOI: 10.3787/j.issn.1000-0976.2020.02.013
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

13. A prediction method of thin mudstone interlayers with gravity flow in deep water areas with fewer wells

Accession number: 20210309770842
Title of translation:
Authors: Zhou, Zhan (1); Yang, Zhaoqiang (1); Hong, Chuqiao (1); Tan, Shun (1); Xiao, Dazhi (1); Pan, Yan (1); Gao, Yujie (1)
Author affiliation: (1) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: December 25, 2020
Publication year: 2020
Pages: 52-58
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Mudstone in the deep-water gas fields of the South China Sea has thin interlayers, unclear distribution rules, and difficult to be recognized by conventional geophysical methods, which has a great impact on the development of gas fields. Therefore, by taking the Miocene Huangliu Formation in the Qiongdongnan Basin as an example,

based on 3D seismic data and drilling data, in combination with regional sedimentary evolution law, on the basis of analyzing the petroelectric characteristics and seismic response characteristics of the mudstone interlayer of the study area, the mudstone genetic types are clarified, so as to obtain finer cognition on the distribution rule of the mudstone interlayer inside the deep-water gas fields. By using the HFE high-resolution frequency extension processing and AIW acoustic impedance inversion technology, the mudstones with various geneses are identified and predicted, and the distribution of mudstone interlayers is characterized in multiple dimensions. The research results were achieved as follows. (1) Under the background of deep-water gravity flow deposition in the study area, there are mainly two types of mudstones, namely, deep-sea argillite mudstones and natural dike mudstones, among which natural dike mudstones have small thickness and fast transverse variation, making it more difficult to predict them. (2) The resolution of the deep-water gravity flow thin mudstone interlayer is significantly improved after HFE high-resolution frequency extension processing, and the relative amplitude relationship and time-frequency characteristics of seismic data are still better. (3) the AIW acoustic impedance inversion method, which is less dependent on well data, can further improve the identification accuracy of seismic data of mudstone interlayers and the effective prediction of thin mudstone interlayers. This study concludes that, the combination of the HFE frequency extension technology and the AIW acoustic impedance inversion technology can effectively improve the identification precision of thin mudstones, and the plane distribution of thin mudstone interlayers can be effectively tracked. These research results have provided a better technical support for the development plan preparation and subsequent development implementation of deep-water gas fields.
Number of references: 19
Main heading: Offshore gas fields
Controlled terms: Acoustic impedance - Clarification - Forecasting - Geophysical prospecting - Hydraulic structures - Levees - Sedimentary rocks - Seismic response - Seismic waves
Uncontrolled terms: Acoustic impedance inversion - Gravity flow depositions - High-resolution frequency - Identification accuracy - Identification precision - Sedimentary evolution - Seismic response characteristics - Time frequency characteristics
Classification code: 442.1 Flood Control - 481.4 Geophysical Prospecting - 482.2 Minerals - 484 Seismology - 484.2 Secondary Earthquake Effects - 512.2.1 Natural Gas Fields - 751.2 Acoustic Properties of Materials - 802.3 Chemical Operations
DOI: 10.3787/j.issn.1000-0976.2020.12.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

14. Water invasion law in deepsea bottom-water gas reservoirs and a water invasion risk identification method

Accession number: 20210309770825
Title of translation:
Authors: Wang, Haidong (1); Liu, Yikun (2); Wang, Fengjiao (2); Wang, Xu (2); Meng, Wenbo (3); Zhang, Jinxin (1); Pang, Yuxin (1)
Author affiliation: (1) Development Technology and Equipment Engineering Research Center of Unconventional Oil and Gas, Liaoning Shihua University, Fushun; 113001, China; (2) Key Laboratory of Enhanced Oil Recovery of Ministry of Education, Northeast Petroleum University, Daqing; 163318, China; (3) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
Corresponding author: Liu, Yikun(liuyikun111@126.com)
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 71-79
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to explore the strategies for water control development of deepsea bottom-water gas reservoirs, this paper carried out a testing experiment of gas production profile along horizontal well and a large-scale 3D physical

simulation experiment of water invasion in bottom-water gas reservoirs, based on the geological, water body and development characteristics of LS17-2 Deepwater Gas Field in the South China Sea. Then, the factors influencing bottom water coning were quantitatively analyzed. And based on this, a water invasion risk identification method suitable for the development of deepsea bottom-water gas reservoirs was developed. And the following research results were obtained. First, water coning in the development process of a bottom-water gas reservoir is influenced by reservoir heterogeneity, production system and horizontal well toe heel effect, and the influence degree of which on water invasion decreases in turn. Second, whether gas well productivity is influenced by water invasion risk is controlled by the aspect ratio (the ratio between the horizontal length of the well control area and the avoiding distance of a horizontal well) of well block. The identification limit of water invasion risk is affected by reservoir heterogeneity. And the stronger the reservoir heterogeneity is, the smaller the safety limit of aspect ratio is. Third, when the reservoir permeability difference is 1, 10, 20 and 30, the corresponding safety limit of aspect ratio is 41.18, 21.61, 12.60 and 5.31, respectively. Fourth, based on the relation curve between permeability difference and safety limit of the aspect ratio, the areal reservoir permeability difference of Well A4H is 30 and its corresponding aspect ratio is 77.20, which is much higher than the safety limit (5.31) of the aspect ratio. It is indicated that the well has high water invasion risk, so water control development is inevitable. Finally, the following strategies were proposed for the water control development of deepsea bottom-water gas reservoirs. First, improve the toe horizontal well heel effect and weaken the influence of reservoir heterogeneity so as to restrain the unbalanced coning of bottom water. And the corresponding water control measures include connected multi-stage artificial bottom hole technology and variable-density screen technology suitable for horizontal wells. Second, adjust the production system to prevent the formation of nonuniform water invasion. And the corresponding water control measure is the periodic gas production technology. Third, build up a water blocking barrier near the bottom hole to inhibit the coning of frontal water head. And the corresponding measure is the water permeable and water blocking gravel packing technology of horizontal well. Fourth, combine these measures comprehensively to form a complementary composite water control development technology for the whole life cycle of a gas reservoir. In conclusion, the research results not only can be used to judge the water invasion risk of deepsea bottom-water gas reservoirs with the reservoir permeability difference of 1-30 and the gas recovery rate of 3%, but also can provide reference for the water control development of offshore and onshore bottom-water gas reservoirs.
Number of references: 19
Main heading: Petroleum reservoir engineering
Controlled terms: Aspect ratio - Gas industry - Gases - Horizontal wells - Life cycle - Offshore gas fields - Offshore gas well production - Offshore gas wells - Offshore oil well production - Petroleum reservoirs - Planning - Safety engineering - Well testing
Uncontrolled terms: Corresponding measures - Development characteristics - Development technology - Gas production technology - Gas well productivities - Permeability difference - Reservoir heterogeneity - Reservoir permeability
Classification code: 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 912.2 Management - 914 Safety Engineering
Numerical data indexing: Percentage 3.00e+00%
DOI: 10.3787/j.issn.1000-0976.2020.12.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

15. Permian volcanic eruption cycle, environment and model in the Jianyang area of the Sichuan Basin

Accession number: 20205009619750
Title of translation: ,
Authors: Xia, Maolong (1); Wen, Long (1); Li, Ya (1); Luo, Bing (1); He, Kailai (1); Liu, Ran (1); Qiu, Yuchao (1); He, Qinglin (1); Chen, Kang (1)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China
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Issue date: September 25, 2020
Publication year: 2020
Pages: 11-22

Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: High-quality pyroclastic reservoirs are developed in the Permian Emeishan basalt in Jianyang area of the Sichuan Basin. Well Yongtan 1 is the first industrial gas well drilling into the Permian pyroclastic gas reservoir in this area. So far, however, volcanic eruption cycle, paleogeographic environment and eruption model in this area have not been clarified, which restricts the understanding of lithofacies and reservoir distribution and the evaluation on exploration zones. Based on the characteristics of volcanic rock assemblage in this area, this paper analyzed the volcanic eruption cycle. Then, combined with the comprehensive result comparison of regional stratigraphy and lithofacies paleogeography, volcanic eruption environment was determined and a volcanic eruption model was established. Finally, the distribution characteristics of regional volcanic mechanism were predicted on the basis of drilling, gravity and magnetism and seismic data. And the following research results were obtained. First, 4 eruption cycles (periods) with 5 sets of lithology are vertically developed in the Permian volcanic rocks of Jianyang area. In the early two cycles, eruption is strong and pyroclastic rocks are dominant. In the late two cycles, energy is weak and shallow intrusive rocks are developed. Second, volcanic rocks in this area are the eruptive products in the continental environment after the uplift of Dongwu movement. The main eruption period is the turn of Middle to Late Permian and one million years (1 Myr) after that, which is basically consistent with the eruption period of Emeishan basalt. Third, the intersection of NE main fault and NW secondary fault in Jianyang-Zhongjiang area is the upwelling channel of deep magma. It controls the development of complex volcanic mechanism formed by the central multi-crater eruption in this area, and it is conducive to the superposed and continuous distribution of pyroclastic rocks of eruptive facies in the large scale. In conclusion, volcanic rocks in Jianyang area and the Emeishan basalt are basically the same in eruption environment and age, but more different in eruption model, lithology and lithofacies. Therefore, volcanic rocks in Jianyang area are a special part of Emeishan large igneous province.
Number of references: 31
Main heading: Volcanoes
Controlled terms: Basalt - Infill drilling - Lithology - Petroleum prospecting - Petroleum reservoir evaluation - Petroleum reservoirs - Seismology - Stratigraphy - Well drilling
Uncontrolled terms: Continental environments - Continuous distribution - Distribution characteristics - Emeishan large igneous provinces - Eruption environment - Lithology and lithofacies - Paleo-geographic environment - Reservoir distribution
Classification code: 481.1 Geology - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations
Numerical data indexing: Age 1.00e+06yr
DOI: 10.3787/j.issn.1000-0976.2020.09.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

16. Simulation of fracture propagation and optimization of ball-sealer in-stage diversion under the effect of heterogeneous stress field

Accession number: 20201708556848
Title of translation:
Authors: Zhou, Tong (1); Chen, Ming (2); Zhang, Shicheng (2); Li, Yuanzhao (3); Li, Fengxia (1); Zhang, Chi (3)
Author affiliation: (1) Sinopec Petroleum Exploration and Production Development Research Institute, Beijing; 100083, China; (2) China University of Petroleum, Beijing, Beijing; 102249, China; (3) Sinopec Chongqing Fuling Shale Gas Exploration and Development Co., Ltd., Chongqing; 408014, China
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Publication year: 2020
Pages: 82-91
Language: Chinese
ISSN: 10000976

CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Ball-sealer in-stage diversion in horizontal wells is a key technique to realize the uniform stimulation of fractured sections in tight oil and gas reservoirs. So far, however, there are fewer research results on the propagation morphologies of multi-cluster fractures after the implementation of different ball-sealer in-stage diversion processes during the fracturing treatment, which results in less theoretical support for the preparation of field ball-sealer in-stage diversion process and measures and impacts its application effects in the fracturing field. To deal with this situation, this paper established a fully coupled "wellbore-perforation-fracture propagation" model of horizontal wells on the basis of the boundary element method. Then, a method for calculating the allocation of ball sealers was proposed. Finally, the number of ball sealers, diversion time and number of diversions during the intra-stage temporary plugging and diversion under the condition of initial heterogeneous stress field and their effects on the propagation of multi-cluster fractures were simulated. And the following research results were obtained. First, the flow restriction of perforation friction can counterbalance the intake difference caused by the induced stress interference so that the friction difference applied on the fluid flow in each fracture cluster is reduced. Second, when the effect of the heterogeneous distribution of the initial stress field is taken into consideration, the liquid intake of each fracture cluster changes greatly and even ineffective perforation clusters without liquid incoming appear in the high-stress region. And after the ball is injected, new fractures are initiated from the ineffective perforation clusters. Third, when the initial minimum horizontal principal stress difference (#h) is higher than 3 MPa, it is beneficial to reduce the non-uniform propagation of each fracture cluster by increasing the number of ball sealers appropriately in the middle stage of the construction (over half of the total perforations of each stage) or carrying out temporary plugging in the early-middle stage (including ball injection in batches in the early-middle stage). Fourth, when #h is lower than 2 MPa, it is necessary to reduce the number of ball sealers or inject balls in the middle-late stage, or the non-uniform propagation of each fracture cluster will be aggravated. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 24
Main heading: Fracture
Controlled terms: Boundary element method - Flow control - Flow of fluids - Friction - Horizontal wells - Oil wells - Petroleum reservoir engineering - Petroleum reservoirs - Sailing vessels - Stresses - Well perforation - Well stimulation
Uncontrolled terms: Fracture propagation - Fracturing treatments - Heterogeneous distributions - Initial stress field - ITS applications - Principal stress - Research results - Tight oil and gas reservoirs
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 631.1 Fluid Flow, General - 674.1 Small Marine Craft - 921.6 Numerical Methods - 951 Materials Science
Numerical data indexing: Pressure 2.00e+06Pa, Pressure 3.00e+06Pa
DOI: 10.3787/j.issn.1000-0976.2020.03.010
Compendex references: YES
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Data Provider: Engineering Village

17. Risk management of deepwater large semi-submersible natural gas production platforms

Accession number: 20210309770773
Title of translation:
Authors: Chen, Hai (1); Xie, Yuhong (2); Feng, Jiaguo (2)
Author affiliation: (1) School of Economics and Management, Beijing University of Posts and Telecommunications, Beijing; 100876, China; (2) CNOOC China Limited, Beijing; 100010, China
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency

Abstract: The semi-submersible production platform in the Lingshui 17-2 Gas Field of the northern South China Sea is the first domestic deepwater semi-submersible production platform (water depth 1 500 m) with high-volume condensate oil stored in the vertical column. In order to identify the potential risks in each of its system and perform risk management, this paper analyzes and evaluates the conventional and special risks of this platform by means of HAZOP, SIL and entropy weight based Bayesian Network, combined with experts' experience. The research methods and procedures are as follows. First, determine the causal relation between the event and the accident, and establish the Bayesian Network. Second, analyze the causes of the accident and determine the maximum cause chain. Third, carry out sensitivity analysis to find out the event which has the greatest influence on the occurrence probability of the accident, so as to provide an important basis for risk prevention and control. Fourth, according to the risk identification and analysis results, propose risk prevention and control suggestions corresponding to each sub-system of the platform. In this way, the risk management process of the semi-submersible platform was established, in which the platform is divided into 11 zones, e. g. mooring, riser, upper platform (gas reception and separation, gas compression, gas dewatering and burning, production water, condensate oil treatment, drainage pipe and torch), hull facility, living zone and cargo working zone. Then, HAZID analysis was carried out on each zone. Finally, risk sources of the platform were identified, including fire and explosion, flue gas diffusion, ship collision, junk, escape, evacuation & rescue, chemical leakage, and condensate oil storage and transportation, and countermeasures to deal with the main risks were provided. In conclusion, the research results provide important reference for the risk management of deepwater oil & gas projects in China in the future.
Number of references: 20
Main heading: Risk management
Controlled terms: Accidents - Bayesian networks - Chemical analysis - Gas condensates - Gases - Natural gas - Natural gas well production - Offshore gas fields - Petroleum industry - Petroleum transportation - Production platforms - Risk assessment - Semisubmersibles - Sensitivity analysis - Submersibles - Water treatment
Uncontrolled terms: Causal relations - Fire and explosion - Natural-gas production - Northern South China Sea - Occurrence probability - Risk Identification - Risk management process - Risk prevention and controls
Classification code: 445.1 Water Treatment Techniques - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 674.1 Small Marine Craft - 674.2 Marine Drilling Rigs and Platforms - 914.1 Accidents and Accident Prevention - 921 Mathematics - 921.4 Combinatorial Mathematics, Includes Graph Theory, Set Theory
Numerical data indexing: Size 1.50e+03m
DOI: 10.3787/j.issn.1000-0976.2020.12.017
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

18. Discovery of carbonate source rock gas reservoir and its petroleum geological implications: A case study of the gas reservoir in the first Member of Middle Permian Maokou Formation in the Fuling area, Sichuan Basin

Accession number: 20203509114385
Title of translation: -
Authors: Hu, Dongfeng (1); Wang, Liangjun (1); Zhang, Hanrong (1); Duan, Jinbao (1); Xia, Wenqian (1); Liu, Zhujiang (1); Wei, Quanchao (1); Wang, Kun (1); Pan, Lei (1)
Author affiliation: (1) Sinopec Exploration Company, Chengdu; Sichuan; 610041, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: July 25, 2020
Publication year: 2020
Pages: 23-33
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Carbonate rocks in the first Member of Maokou Formation, Middle Permian in the Sichuan Basin (hereinafter "Mao 1 Member" for short) have been taken as a set of source rocks, and they have not been specifically studied from the aspects of reservoir evaluation and testing. By referring the exploration ideas of unconventional natural gas, the Fuling area of southeastern Sichuan Basin have obtained industrial gas flow in development well from Mao 1 Member

in recent years. In order to clarify the natural gas exploration potential of Mao 1 Member in this area, it is necessary to study its sedimentary characteristics, natural gas reservoir forming conditions and main control factors based on the data of field section measurement, drilling system coring and laboratory testing. And the following research results were obtained. First, the gas reservoir in Mao 1 Member in the Fuling area is of source-reservoir integration, and its natural gas is mainly enriched in blackish gray marlite and nodular marlite. Second, its reservoir spaces are dominated by grain boundary pores (fractures), diagenetic shrinkage pores (fractures), organic pores and fractures. Third, the pores are mostly in a nanometerscale, and the main pore diameter is in the range of 5-50 nm, which is between shale reservoir and conventional reservoir and with a strong heterogeneity. Fourth, the gas reservoir is characterized by source-reservoir coexistence, lithology controlling reservoir and extensive layered distribution, presenting two-stage differential hydrocarbon enrichment, namely intraformational near-source enrichment in the early stage and interformational blowdown adjustment in the late stage. Fifth, the development of blackish gray organic-rich fine marlite which is deposited with the episodic upwelling in the outer ramp facies belt is the foundation for the formation of natural gas reservoir, the transformation of clay minerals controls the development of quality reservoirs, good preservation condition is the key to the formation of natural gas reservoir, and fracture development is favorable for the enrichment and high yield of natural gas. In conclusion, Mao 1 Member in this area is a special type of gas reservoir, i.e., carbonate source rock gas reservoir, which has greater potential of natural gas exploration and industrial gas flow have been obtained in many wells. What's more, the discovery of such type of gas reservoirs not only expands the field of natural gas exploration in the Sichuan Basin, but provides the reference for the natural gas exploration in South China and other areas.
Number of references: 33
Main heading: Natural gas wells
Controlled terms: Carbonation - Flow of gases - Fracture - Gases - Geological surveys - Grain boundaries - Lithology - Natural gas - Organic minerals - Petroleum geology - Petroleum prospecting - Petroleum reservoir evaluation - Petroleum reservoirs - Quality control - Rocks
Uncontrolled terms: Carbonate source rocks - Natural gas exploration - Natural gas reservoir - Pores and fractures - Preservation condition - Sedimentary characteristics - Strong heterogeneities - Unconventional natural gas
Classification code: 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1.2 Gas Dynamics - 802.2 Chemical Reactions - 913.3 Quality Assurance and Control - 951 Materials Science
Numerical data indexing: Size 5.00e-09m to 5.00e-08m
DOI: 10.3787/j.issn.1000-0976.2020.07.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

19. Temperature variation tests and mechanism analysis of rock breaking by bit cutters

Accession number: 20210109725387
Title of translation:
Authors: Zhou, Qin (1, 2); Zhang, Zaixing (1, 2); Zhang, Kai (1, 2); Zheng, Guojing (1, 2); He, Luzhong (1, 2)
Author affiliation: (1) School of Engineering and Technology, China University of Geosciences, Beijing; 100083, China; (2) MLR Key Laboratory on Deep Geological Drilling Technology, Beijing; 100083, China
Corresponding author: Zhang, Zaixing(17685936273@163.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 10
Issue date: October 25, 2020
Publication year: 2020
Pages: 102-110
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: A bit cutter is the core component to break rocks. Most of the work done in the process of rock breaking is converted into cutting heat, which increases the temperature of the cutter. The current research results on the influential factors of cutter temperature mainly focus on cutting depth, cutting speed and cutter structure, etc., while the influence degree and mechanism of rock characteristics on the cutter temperature have not been clarified yet. For this reason, this paper carried out a drilling test of four typical types of rocks, including sandstone, marble, granite

and basalt, on the independently made MDES 2000 micro-drilling platform. Then, based on rock breaking mechanics model and numerical analysis results, the influence degree of rock characteristics on the cutter temperature was discussed and the influence mechanism was analyzed. And the following research results were obtained. First, with the same drilling parameters, the rock strength directly influences the drilling depth of different rocks, which leads to the transformation of the rock breaking mode (plasticity and brittleness), resulting in different cutter temperature fluctuations in different rocks. When plastic crushing occurs in sandstones and marbles, the temperature fluctuation range of the cutter is about ±0.5; When brittle crushing occurs in granites and basalts, the temperature fluctuation range is about ±1.5. Second, rock strength is an important factor influencing the rise rate of cutter temperature. Higher rock strength requires stronger cutting force, causing the increase of cutter temperature, so the temperature rise rate is increased gradually with the increase of rock strength in the process of drilling the four types of rocks. Third, the rock breaking mechanics model and the analysis results on the temperature of rake face and flank face show that the rake face of cutter plays an important role in cutting and it is the main factor leading to different fluctuation degrees of cutter temperature in different rocks. In conclusion, the temperature change trend in the drilling test is basically consistent with numerical simulation results. These research results can provide reference for the studies on the service life of bit cutters.
Number of references: 38
Main heading: Infill drilling
Controlled terms: Basalt - Crushing - Cutting - Drills - Fracture mechanics - Granite - Plasticity - Sandstone - Temperature distribution
Uncontrolled terms: Drilling parameters - Influence mechanism - Influential factors - Rock characteristics - Temperature changes - Temperature fluctuation - Temperature rise rate - Temperature variation
Classification code: 482.2 Minerals - 511.1 Oil Field Production Operations - 603.2 Machine Tool Accessories - 641.1 Thermodynamics - 931.1 Mechanics - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.10.012
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

20. Application and prospect of the wellbore four-phase flow theory in the field of deepwater drilling and completion engineering and testing

Accession number: 20210309770797
Title of translation:
Authors: Sun, Baojiang (1); Wang, Xuerui (1); Sun, Xiaohui (1); Li, Hao (1); Wang, Zhiyuan (1); Gao, Yonghai (1); Lu, Yiyu (2)
Author affiliation: (1) School of Petroleum Engineering, China University of Petroleum-East China, Qingdao; 266580, China; (2) School of Resources and Safety Engineering, Chongqing University, Chongqing; 400044, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Publication year: 2020
Pages: 95-105
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the drilling and completion process of an offshore deepwater oil & gas well, fluid flow in the wellbore is a complex four-phase flow process with multiple components, phase transition and flow pattern transformation. In order to further reveal the multi-phase flow laws in the wellbore of deepwater drilling and completion, this paper illustrated the application progress of wellbore four-phase flow theory in the field of deepwater oil & gas drilling and completion engineering. Then, in view of the limitations of the theory in some special working conditions of deepwater drilling and completion, the future development trend of wellbore multi-phase flow theory was prospected. And the following research results were obtained. First, the wellbore four-phase flow theory of deepwater drilling and completion can fully consider the various physical and chemical phenomena in the deepwater wellbore and accurately describe the transient temperature and pressure in the wellbore, which provides a solid theoretical base for the optimized design of hydraulic parameters of deepwater drilling and completion. Second, after well kick happens during deepwater drilling,

under the action of low temperature and high pressure at mud line, the gas phase in the wellbore tends to change into natural gas hydrate (hereinafter, "hydrate" for short), which changes the distribution characteristics of wellbore gas volume fraction. Third, under the action of high temperature and high pressure at the bottom hole, the acid gas in the wellbore undergoes supercritical phase transition, which makes the gas invasion of sour gas "hidden". Fourth, in the testing process of a deepwater gas well, the wellbore four-phase flow theory can accurately describe the whole process of hydrate deposition and blockage in the wellbore, which provides a theoretical basis for hydrate prevention and control in the testing process of the deepwater gas well. Fifth, the development trend of the wellbore multi-phase flow theory of deepwater drilling will include studies on the coupling mechanism between wellbore and deepwater special formation, the wellbore multi-phase flow theory of deepsea hydrate drilling, and the wellbore multi-phase flow theory supporting new deepwater drilling technologies.
Number of references: 41
Main heading: Offshore gas wells
Controlled terms: Deepwater drilling - Flow patterns - Gas hydrates - Gases - Hydration - Infill drilling - Multiphase flow - Natural gas well completion - Offshore boreholes - Offshore gas well production - Offshore oil well production - Offshore oil wells - Oil field development - Oil field equipment - Oil well completion - Oil well drilling - Temperature - Well testing
Uncontrolled terms: Application progress - Distribution characteristics - Drilling and completion - High temperature and high pressure - Hydraulic parameters - Pattern transformations - Prevention and controls - Transient temperature
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1 Fluid Flow, General - 641.1 Thermodynamics
DOI: 10.3787/j.issn.1000-0976.2020.12.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

21. Relationship between geological structure and marine shale gas preservation conditions in the western Middle Yangtze Block

Accession number: 20202308799543
Title of translation:
Authors: Chen, Kongquan (1); Zhang, Douzhong (1); Tuo, Xiusong (1)
Author affiliation: (1) Hubei Cooperative Innovation Center of Unconventional Oil and Gas, Yangtze University, Wuhan; Hubei; 430100, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 4
Issue date: April 25, 2020
Publication year: 2020
Pages: 9-19
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Lower Paleozoic dark shale is developed in the western Middle Yangtze Block, which lays a material foundation for the enrichment and accumulation of marine shale gas. In order to ascertain the control action of geological structures on the differential preservation of shale gas and reveal the key factors in shale gas preservation, this paper firstly analyzed the structure characteristics of this area, carried out structure pattern recognition and structural belt division, and studied structural deformation mode and intensity. Based on this, the relationships between different structure styles and shale gas preservation conditions were analyzed. Finally, combined with the structural deformation and the lithofacies paleogeographic characteristics of marine shale, the favorable exploration zones of shale gas were proposed. And the following research results were obtained. First, the western Middle Yangtze Block can be divided into four structural deformation zones, and three types of piggyback structural patterns have been identified, including restricted type, weakly reformed type and strongly reformed type. Second, the restricted type is located in the northwestern part of Hunan and Hubei Provinces. In this pattern, piggyback structure is incomplete and thrust belt and compression fold belt are developed. Third, the weakly and strongly reformed types are located

in the western parts of Hunan and Hubei, and Wulingshan area, respectively. They both have complete piggyback structures, but the former has lower deformation intensity and has never undergone the late superimposed reformation. Fourth, there are three structural transfer belts in the western Middle Yangtze Block, i.e. the structural transfer belt between the East Sichuan fault-fold belt and West Hunan-Hubei fault-fold belt, the structural transfer belt between West Hunan-Hubei fault-fold belt and Wulingshan fault-fold belt, and the structural transfer belt between the outcrop and the hinterland of Middle Yangtze Block. The first one is structurally transformed at the Qiyueshan fault. The East Sichuan fault-fold belt on the west is an ejective fold with low fault density and formation denudation intensity, where shale gas is enriched in anticlines and slopes; while the West Hunan-Hubei fault-fold belt on the east is a trough-like fold with strong faulting and high formation denudation intensity, where shale gas is enriched in residual synclines. In conclusion, shale gas preservation conditions of Upper Ordovician Wufeng Formation-Lower Silurian Longmaxi Formation in this area are the best in Zigui syncline, thrust-detachment zone and western margin of Qiyueshan fault. The favorable exploration areas of shale gas of Lower Cambrian Niutitang Formation are distributed in the western flank of Yichang slope, Kaixian thrust zone, compression fold zone and thrust-detachment zone.
Number of references: 28
Main heading: Faulting
Controlled terms: Deformation - Erosion - Gases - Pattern recognition - Petroleum prospecting - Shale gas
Uncontrolled terms: Deformation intensity - Different structure - Enrichment and accumulations - Geological structures - Preservation condition - Structural deformation - Structural pattern - Structure characteristic
Classification code: 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels
DOI: 10.3787/j.issn.1000-0976.2020.04.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

22. Policy-driven clean heating modes in the rural areas of the northern China

Accession number: 20201708556862
Title of translation:
Authors: Zhou, Shuhui (1); Sun, Hui (1); Wang, Chenlong (2); Liang, Yan (1)
Author affiliation: (1) PetroChina Planning and Engineering Institute, Beijing; 100083, China; (2) Beijing Municipal Institute of Labour Protection, Beijing; 100050, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 3
Issue date: March 25, 2020
Publication year: 2020
Pages: 146-156
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Clean heating in the rural areas of the northern China in winters is an important part of the energy consumption revolution and rural lifestyle revolution, and it is also a major livelihood project and a heart-warming project. Therefore, it is widely concerned to give considerations to its economy, applicability and environmental requirements. In this paper, "2+26" cities in the Beijing-Tianjin-Hebei area and its periphery, which is an important area with clean heating in the countryside, were taken as the research object. Based on field survey and household measurement, four main clean heating methods (wall-mounted gas boiler, regenerative electric heater, air source heat pump and clean coal heating) in this area were analyzed and compared in terms of technology, economy and environment. In addition, some specific suggestions were proposed. And the following research results were obtained. First, wall-mounted gas boiler is a more cost-effective alternative to coal-fired heating, but the access to product's energy efficiency and emission shall be controlled strictly. It is recommended to popularize energy-saving and environmentally-friendly condensing wall-mounted boilers in cities and in economically developed rural areas. Second, there are no thermal insulation measures in existing buildings in rural areas and heating energy consumption is high, so more attention shall be paid to thermal insulation measures. And it is suggested to carry out energy-saving transformation on houses and provide appropriate subsidies while promoting clean heating, and to propel the centralized heating during the construction of new urbanization in rural areas. Third, clean-coal heating will still exist

in some rural areas for a long time. Therefore, it is necessary to strengthen the supervision of coal quality, and it is recommended to adopt a set of "clean coal + special stove + carbon monoxide monitoring" measures. Fourth, it is necessary to adopt measures according to local conditions. That is to choose the appropriate heating path and heating equipment on the basis of local resource characteristics. In the areas with abundant renewable energy and good grid supporting conditions, it is advisable to focus on the popularization of regenerative electric heaters or air source heat pumps for heating. Fifth, to ensure the stable operation of rural areas in the era of "post coal to gas and coal to electricity", it is recommended that the state shall conduct a comprehensive study on the formulation of subsidy exit mode and precise subsidies for poor households after the exit and strengthen the implementation of environmental protection policies and green development concepts, so as to truly reach the goal of "affordable transformation, affordable utilization, and content utilization".
Number of references: 22
Main heading: Air source heat pumps
Controlled terms: Boilers - Carbon monoxide - Coal - Coal industry - Coal research - Cost effectiveness - Electric heat treatment - Electric heating - Energy efficiency - Energy utilization - Rural areas - Thermal insulation - Walls (structural partitions)
Uncontrolled terms: Environmental requirement - Heating energy consumption - Insulation measures - Local conditions - Renewable energies - Research results - Stable operation - Supporting conditions
Classification code: 408.2 Structural Members and Shapes - 413.2 Heat Insulating Materials - 524 Solid Fuels - 525.2 Energy Conservation - 525.3 Energy Utilization - 537.1 Heat Treatment Processes - 614 Steam Power Plants - 616.1 Heat Exchange Equipment and Components - 642.1 Process Heating - 804.2 Inorganic Compounds - 911.2 Industrial Economics
DOI: 10.3787/j.issn.1000-0976.2020.03.018
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

23. Genesis and source of shallow natural gas in the Jiyang Depression of the Bohai Bay Basin

Accession number: 20202508844793
Title of translation:
Authors: Gao, Changhai (1); Zhang, Yunyin (2); Wang, Xingmou (2)
Author affiliation: (1) Key Laboratory of Deep Oil and Gas, China University of Petroleum-East China, Qingdao; Shandong; 266580, China; (2) Geophysical Research Institute, Sinopec Shengli Oilfield Company, Dongying; Shandong; 257000, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 26-33
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: There are abundant Paleogene and Neogene shallow natural gas resources in the Jiyang Depression of the Bohai Bay Basin, but their genesis and sources have been controversial. In order to provide theoretical support for the exploration of shallow natural gas in the Jiyang Depression, this paper analyzed the geochemical characteristics of shallow natural gas in this area based on the test data of gas compositions, light hydrocarbon fingerprints and carbon isotopes. Then, the genetic types of shallow natural gas were determined. Finally, the sources of shallow natural gas were discussed. And the following research results were obtained. First, shallow natural gas in the Jiyang Depression is mainly composed of methane and its dry coefficient is high (over 95%), so it is classified as typical dry gas. Second, light hydrocarbon has a low n-alkane content and high isoparaffin content, so it presents as oil-type gas with biodegradation characteristics. Third, The carbon isotopes of methane are lighter (-55.7‰ -42.3‰), the carbon isotopes of ethane and propane are reversed, and the carbon isotopes of CO2 are heavier, so it has the characteristics of typical crude oil degradation gas and wet gas composition transformation. In conclusion, shallow natural gas in the Jiyang Depression is mixed secondary gas of biogenesis and thermogenetic transformation, which is

the biodegradation product of conventional oil reservoirs. It is composed of crude oil degradation gas and oil-dissolved released gas, and the proportion of crude oil degradation gas is more than 60%. What's more, shallow natural gas in heavy oil areas shall be taken as an important exploration and development target for reserves and production increase in the Jiyang Depression.
Number of references: 39
Main heading: Proven reserves
Controlled terms: Biodegradation - Carbon - Crude oil - Exploratory geochemistry - Gases - Heavy oil production - Hydrocarbons - Isotopes - Methane - Natural gas - Natural gas deposits - Paraffins - Petroleum industry - Petroleum reservoir engineering - Petroleum reservoirs - Reserves to production ratio
Uncontrolled terms: Biodegradation characteristics - Biodegradation products - Exploration and development - Geochemical characteristic - Jiyang Depression - Light hydrocarbon - Natural gas resources - Production increase
Classification code: 461.8 Biotechnology - 481.2 Geochemistry - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 804 Chemical Products Generally - 804.1 Organic Compounds
Numerical data indexing: Percentage 6.00e+01%, Percentage 9.50e+01%
DOI: 10.3787/j.issn.1000-0976.2020.05.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

24. Seismic stepped prediction technology for tight sandstone gas sweet spot in coal measure strata: A case study of the Submember 23 of the Lower Permian Shanxi Formation along the southeastern margin of the Ordos Basin

Accession number: 20202508844999
Title of translation: -23
Authors: Li, Guobin (1); Zhang, Yajun (1); Xie, Tianfeng (1); Shi, Xiaoqian (1); Wang, Ronghua (1); Li, Xingtao (2); Liu, Xiongzhi (1); Jing, Ziyan (1)
Author affiliation: (1) Research Institute of Petroleum Exploration & Development-Northwest, PetroChina, Lanzhou; Gansu; 730020, China; (2) PetroChina Coalbed Methane Company Limited, Beijing; 100028, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: May 25, 2020
Publication year: 2020
Pages: 34-42
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Submember 23 of the Lower Permian Shanxi Formation (hereinafter, "Shan 23 Submember" for short) in the southeastern Ordos Basin is an important target of natural gas exploration in this basin. However, the reservoir of Shan 23 Submember is characterized by small thickness, fast thickness variation and strong heterogeneity, and its reservoir prediction and exploration target selection is difficult. In order to accurately predict the sweet spots of tight sandstone gas in the coal measure strata and improve its success rate of exploration, this paper proposed a seismic stepped prediction technology based on the characteristics and prediction difficulties of this reservoir, including the 90° phase-shifting technology to determine channel outline, the model constrained wave impedance inversion to characterize sandbody thickness,and the wavelet attenuation gradient attribute to identify gas-bearing sand bodies. And the following research results were obtained. First, Shan 23 Submember is overlain by No.5 coal bed of strong seismic reflection and its underlying formation has weak seismic reflection energy. In addition, there is a sparse 2D seismic grid and a low well control degree. Therefore, tight sandstone gas sweet spot prediction is high difficulty. Second, under the constraint of seismic stepped prediction, the proposed technology can be used to efficiently characterize the distribution of channel sand bodies and identify effective gas-bearing reservoirs, so as to increase the prediction accuracy of exploration and development targets. Third, the exploration and development targets deployed on the basis of this technology present a good drilling effect, the seismic prediction result has high lateral resolution, and the variation characteristics of channels and channel sand bodies are reflected truly. In conclusion, the application of this method can solve the geological difficulties of predicting tight sandstone gas sweet spots in strong-heterogeneity

thin reservoirs of coal measure strata in a 2D seismic exploration area.
Number of references: 36
Main heading: Oil bearing formations
Controlled terms: Coal - Coal deposits - Coal industry - Forecasting - Gas bearings - Gases - Metamorphic rocks - Petroleum prospecting - Sandstone - Seismic prospecting - Seismic waves - Seismology - Tight gas
Uncontrolled terms: Exploration and development - High-lateral resolution - Natural gas exploration - Phase-shifting technology - Prediction technologies - Strong heterogeneities - Variation characteristics - Wave impedance inversion
Classification code: 482.2 Minerals - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 524 Solid Fuels - 601.2 Machine Components
DOI: 10.3787/j.issn.1000-0976.2020.05.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

25. Exploration status of the deep Sinian strata in the Sichuan Basin: Formation conditions of old giant carbonate oil/gas fields

Accession number: 20201208317996
Title of translation:
Authors: Zhao, Wenzhi (1); Wang, Zecheng (1); Jiang, Hua (1); Fu, Xiaodong (2); Xie, Wuren (1); Xu, Anna (1); Shen, Anjiang (2); Shi, Shuyuan (1); Huang, Shipeng (1); Jiang, Qingchun (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) PetroChina Hangzhou Institute of Geology, Hangzhou; Zhejiang; 310023, China
Corresponding author: Wang, Zecheng(wangzecheng@petrochina.com.cn)
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Issue date: February 25, 2020
Publication year: 2020
Pages: 1-10
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: To construct a giant Sichuan gas province, it is in an urgent need of exploring new replacement areas with abundant natural gas resources and great exploration potential. In this paper, the formation conditions (e.g. source rock, reservoir and play) and the distribution laws of the deep-seated old giant marine carbonate oil/gas fields in China's Craton Basins were investigated systematically. Then, the accumulation and enrichment conditions of deep Sinian natural gas in the Sichuan Basin were analyzed. Finally, potential and favorable target zones of natural gas exploration in the Dengying Formation of Upper Sinian were evaluated. And the following research results were obtained. First, the effectiveness and scale of source kitchens, reservoirs and reservoir-caprock assemblages and the proximity are the necessary conditions for the formation of deep-seated giant carbonate oil/gas fields, and paleo-uplifts, paleo-slopes and paleo-fault zones are the favorable areas of searching deep-seated giant carbonate oil/gas fields. Second, in the Sichuan Basin, three sets of high-quality source rocks are developed in the Neoproterozoic-Cambrian System, and their maturity of organic matter is still in the optimal window for cracking gas, so the gas generation scale is large. Third, after the microbial carbonate rocks of Dengying Formation in the Sichuan Basin were reconstructed by constructive diagenesis, effective reservoirs are formed and distributed widely. Fourth, owing to the integrated source rocks and cap rocks of Dengying Formation, the marginal platform and the intra platform have favorable conditions for proximal hydrocarbon accumulation. In conclusion, the deep Sinian in the Sichuan Basin has good conditions of hydrocarbon accumulation and it is an important replacement area of natural gas exploration. Paleo-uplifts and slopes in the central Sichuan Basin have been the favorable locations of natural gas accumulation for a long period. Large-scale exploration shall focus on four favorable areas, including the marginal platform zone in the fourth Member of Dengying Formation, the marginal platform zone in the second Member of Dengying Formation, the bioherm beach body of Dengying Formation intra platform in the paleo-uplifts and slopes of the central Sichuan Basin, and the bioherm

beach body of Dengying Formation in the eastern Sichuan Basin.
Number of references: 32
Main heading: Petroleum prospecting
Controlled terms: Beaches - Carbonates - Carbonation - Energy resources - Gases - Geological surveys - Hydrocarbons - Natural gas - Natural gas fields - Oils and fats - Petroleum deposits - Reefs - Sedimentary rocks
Uncontrolled terms: Cap rock - Enrichment and accumulations - Giant gas province - Microbial carbonates - Sichuan Basin - Sinian
Classification code: 407.3 Coastal Engineering - 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 802.2 Chemical Reactions - 804.1 Organic Compounds - 804.2 Inorganic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.02.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

26. Mechanism of wellbore instability in continental shale gas horizontal sections and its water-based drilling fluid countermeasures

Accession number: 20202308799549
Title of translation:
Authors: Wang, Bo (1, 2); Sun, Jinsheng (1, 3); Shen, Feng (2); Li, Wei (2); Zhang, Wenzhe (2)
Author affiliation: (1) School of Petroleum Engineering, China University of Petroleum , Qingdao; Shandong; 266580, China; (2) Research Institute, Shaanxi Yanchang Petroleum Co. Ltd., Xi'an; Shaanxi; 710075, China; (3) CNPC Engineering Technology R&D Co. Ltd., Beijing; 102206, China
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The wellbore instability in the horizontal sections of continental shale gas wells in the Ordos Basin is a major engineering and technical problem that restricts the exploration and development of the shale gas resources in the Yanchang Formation of Upper Triassic of Mesozoic in the Yanchang Block. To solve this problem, this paper analyzed the characteristics of mineral components in shale by means of X-ray diffraction. In addition, its physical and chemical characteristics, specific surface area and microstructure were analyzed. On this basis, a shale water-based drilling fluid system (PSW-2) of low free water activity based on nano plugging was developed. And it was applied on site at five horizontal wells in continental shale gas reservoirs to ensure the wellbore stability of their long horizontal sections. And the following research results were obtained. First, the Yanchang Formation shale in this area has a high content of clay mineral, and it is a fractured formation of weak expansion, easy dispersion and multiple bedding, so the wellbore instability here is the result of the comprehensive action of mechanical factors, physical and chemical factors, drilling mechanical disturbance, etc. Second, the shale has average pore diameter is 4.494-8.502 nm and is characterized by obvious capillary action, strong water absorption capacity and uneven hydration, which result in the decrease of local shale strength, so sudden collapse tends to happen easily. Third, the API loss of PSW-2 system is less than 2.8 mL, the rolling recovery rate is 95.15% (close to the recovery rate of oil-based drilling fluid 98.25%), the linear expansion rate is as low as 1.38%, and the wetting angle increases from 26° of dry rock samples to 56.5°. Fourth, the compressive strength of the system after immersion increases to 95.806 MPa, which is close to the original rock strength (110.70 MPa). It is concluded that this water-based drilling fluid system can effectively ensure wellbore stability by blocking the pores of shale with micro nano components, reducing the activity of liquid phase to increase the inhibition, and weakening the multi-element collaboration of the capillary imbibition effect of shale.

Number of references: 22
Main heading: Exploratory boreholes
Controlled terms: Chemical analysis - Compressive strength - Drilling fluids - Energy resources - Expansion - Horizontal drilling - Horizontal wells - Infill drilling - Oil field equipment - Oil wells - Petroleum prospecting - Petroleum reservoirs - Shale gas - Stability - Water absorption - Wetting
Uncontrolled terms: Exploration and development - Fractured formations - Mechanical disturbance - Oil-based drilling fluid - Physical and chemical characteristics - Water absorption capacity - Water based drilling fluids - Wellbore instability
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 802.3 Chemical Operations - 951 Materials Science
Numerical data indexing: Percentage 1.38e+00%, Percentage 9.52e+01%, Percentage 9.82e+01%, Pressure 1.11e+08Pa, Pressure 9.58e+07Pa, Size 4.49e-09m to 8.50e-09m, Volume 2.80e-06m3
DOI: 10.3787/j.issn.1000-0976.2020.04.013
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

27. Development models of Xixiangchi Formation karst reservoirs in the Late Caledonian in the central Sichuan Basin and its oil-gas exploration implications

Accession number: 20205009619778
Title of translation:
Authors: Li, Wenzheng (1, 2); Wen, Long (3); Gu, Mingfeng (1); Xia, Maolong (3); Xie, Wuren (4); Fu, Xiaodong (1); Ma, Shiyu (4); Tian, Han (1); Jiang, Hua (4); Zhang, Jianyong (1, 2)
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Corresponding author: Zhang, Jianyong(zhangjy_hz@petrochina.com.cn)
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Oil and gas shows are abundant in the process of drilling the Cambrian Xixiangchi Formation in the Sichuan Basin, so this formation is the reserve exploration area and the important replacement formation in this basin. At present, however, it is less explored and the distribution laws of its high-quality reservoirs are not understood sufficiently. In order to determine the next natural gas exploration directions and targets of Xixiangchi Formation in the central Sichuan Basin, this paper studied its reservoir characteristics and the distribution of karst unconformity using the well-seismic combination method, based on observation data of typical field outcrops, cores and thin sections. Then, a development model of the Xixiangchi Formation karst reservoirs in the Late Caledonian in this area was established, and the favorable development area of shoal-facies karst reservoir was predicted. And the following results were obtained. First, the Xixiangchi Formation reservoir is lithologically composed of grain dolomite and crystalline dolomite. The reservoir space is dominated by dissolved pores, intergranular pores, intercrystalline pores and fractures. It is a low porosity and low permeability fractured-porous reservoir with an average porosity of 3.46% and an average permeability of 0.99 mD. Second, in the Xixiangchi Formation, there is a ring-shaped denudation zone that is wide in the central part and narrow in the southern and northern sides, and 6-50 km in width and 4 700 km2 in area. Third, due to formation uplifting and denudation in the development area of denudation zone in the Late Caledonian, strong weathering crust karstification occurred in the Xixiangchi Formation, and two types of reservoirs were developed, including the shoal-facies superimposed supergene karst reservoir in the exposed denudation area and the shoal-facies superimposed bedding karst reservoir in the buried area. Fourth, the Xichong-Guang'an-Tongnan

area is the most favorable area for the development of shoal-facies karst reservoir, covering an area of 5 000 km2. In conclusion, Xichong-Guang'an area is adjacent to the hydrocarbon generating center of Lower Cambrian Qiongzhusi Formation. In this area, hydrocarbon source faulting is developed, and the Xixiangchi Formation has large shoal bodies and strong karstification, so a large-scale effective reservoir of shoal facies superimposed Late Caledonian karstification tends to form. Therefore, it can be taken as a favorable target of natural gas exploration in the Xixiangchi Formation in the next step.
Number of references: 26
Main heading: Low permeability reservoirs
Controlled terms: Erosion - Geological surveys - Hydrocarbons - Landforms - Natural gas - Natural gas wells - Petroleum reservoir engineering - Porosity - Proven reserves - Textures
Uncontrolled terms: Average permeability - Central Sichuan Basin - Effective reservoir - Fractured-porous reservoirs - High quality reservoir - Intercrystalline pores - Natural gas exploration - Reservoir characteristic
Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 522 Gas Fuels - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Area 4.70e+09m2, Area 5.00e+09m2, Percentage 3.46e+00%, Size 6.00e+03m to 5.00e+04m
DOI: 10.3787/j.issn.1000-0976.2020.09.004
Compendex references: YES
Database: Compendex

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28. Controlling effect of pressure evolution on shale gas reservoirs: A case study of the Wufeng-Longmaxi Formation in the Sichuan Basin

Accession number: 20210109725851
Title of translation: --
Authors: Wang, Ruyue (1, 2, 3); Nie, Haikuan (1, 2, 3); Hu, Zongquan (1); Liu, Guangxiang (1); Xi, Binbin (4); Liu, Weixin (4)
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The exploration and development practice of marine shale gas in southern China shows that formation pressure has an important influence on the preservation, exploration and development of shale gas. In order to further clarify the influence of pressure evolution on the evolution of shale gas reservoirs, this paper took the shale of Upper Ordovician Wufeng Formation-Lower Silurian Longmaxi Formation in the Sichuan Basin and its periphery as the research object to study the controlling effect of pressure evolution on shale gas reservoirs based on lithofacies, physical property, pore structure, inclusion analysis, microscopic characteristics and other data. And the following research results were obtained. First, the physical properties and pore structures of a shale gas reservoir are under the joint control of lithofacies, burial depth and pressure evolution. And the pore overpressure inhibits the burial compaction, which is generally beneficial to the maintenance of organic pores and the improvement of physical properties. Second, the period and the intensity of pressure relief influence the differential evolution of different lithofacies in the Wufeng-Longmaxi Formation shale, and their influence on high stress-sensitive argillaceous shale is particularly obvious, but less on siliceous shale. Third, regional uplift and late pressure relief, and short pressure relief duration and low pressure relief intensity are the most beneficial to the maintenance of organic pores and the improvement of reservoir physical properties. Fourth, the deep shale gas reservoirs in the Sichuan Basin have

low pressure relief degree and superior preservation conditions, and their physical properties are generally better than those in the normal pressure-overpressure area along the basin margin. And organic-rich siliceous shale and argillaceous shale both have better reservoir properties. Fifth, in the normal-pressure area along the basin margin, the pressure relief degree is higher, and the argillaceous-rich shale gradually evolves into direct cap rocks as its sealing capacity increases and the reservoir capacity decreases.
Number of references: 27
Main heading: Pressure effects
Controlled terms: Clay minerals - Evolutionary algorithms - Gases - Marine engineering - Optimization - Petroleum prospecting - Petroleum reservoirs - Physical properties - Pore structure - Shale gas - Stress relief
Uncontrolled terms: Differential Evolution - Exploration and development - Formation pressure - Microscopic characteristics - Preservation condition - Pressure evolution - Reservoir physical property - Shale gas reservoirs
Classification code: 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 675 Marine Engineering - 921.5 Optimization Techniques - 931.1 Mechanics - 931.2 Physical Properties of Gases, Liquids and Solids
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Compendex references: YES
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29. Effect of annular pressure on the fatigue damage of deepwater subsea wellheads

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Title of translation:
Authors: Wang, Yanbin (1); Zeng, Jing (2, 3); Gao, Deli (1)
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ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the testing process of offshore deepwater oil and gas wells, the produced high temperature (HP) fluid can heat the surrounding casing and the liquid in the annulus of multi-layer casing during its upward flowing, which will lead to liquid expansion in the sealed wellbore and induce sustained casing pressure. The existence of sustained casing pressure can change the stress state at the subsea wellhead fatigue hotspot which can bring adverse influence on the subsea wellhead fatigue damage and consequently restricts the long-term safe and efficient operation of deepwater oil and gas wells. In order to provide scientific guidance for the long-term safe operation of deepwater oil and gas wells, this paper established a model for calculating the sustained casing pressure of a subsea well by considering the physical parameters of annulus fluid and the coupling influence of thermal expansion of annulus liquid and annulus volume change. The sustained casing pressure was solved by using the iteration method, and the calculated sustained casing pressure was introduced into the finite element model of subsea wellhead. Then, the stress state at the fatigue hotspot of the subsea wellhead under the condition of sustained casing pressure was studied by taking the weld between surface casing and HP wellhead housing as the research object. Finally, the influence laws of sustained casing pressure, top of cement and HP wellhead housing height above the mud line on the subsea wellhead fatigue damage were investigated. And the following research results were obtained. First, the existence of sustained casing pressure can aggravate the subsea wellhead fatigue damage. The higher the sustained casing pressure is, the more serious the fatigue damage is. Second, the farther the top of cement outside the surface casing is from the mud line, the less the subsea wellhead fatigue damage is. Third, the subsea wellhead fatigue damage increases with the increase of the HP wellhead housing height above the mud line. In conclusion, the subsea wellhead fatigue damage

can be mitigated by controlling the sustained casing pressure of the subsea wellhead effectively and designing the casing program reasonably.
Number of references: 26
Main heading: Wellheads
Controlled terms: Cements - Fatigue damage - Housing - Iterative methods - Liquids - Natural gas well production - Offshore boreholes - Offshore gas wells - Offshore oil well production - Offshore oil wells - Oil well casings - Thermal expansion - Thermal fatigue - Well testing
Uncontrolled terms: Annular pressures - High temperature - Iteration method - Physical parameters - Research results - Subsea wellhead - Sustained casing pressure - Testing process
Classification code: 403.1 Urban Planning and Development - 412.1 Cement - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 921.6 Numerical Methods - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.12.013
Compendex references: YES
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30. Submarine multiphase pipeline transport containing natural gas hydrate and its plugging risk prevention and control

Accession number: 20210309770816
Title of translation:
Authors: Gong, Jing (1); Shi, Bohui (1); Chen, Yuchuan (1); Song, Shangfei (1)
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to promote the operational safety level of the subsea multiphase flow transportation system in the oil and gas development of deep-water fields, and to push the industrialization application of the hydrate slurry transportation technology, based on the hydrate flow experiment platform of China University of Petroleum (Beijing), combined with the kinetics mechanism of hydrate formation, the theories of multiphase flow and reliability, the theory and technology of multiphase flow involving hydrate plugging risks in multiphase pipeline containing hydrate were investigated. The following results are obtained. (1) The presence of hydrate particles can reduce the stratified flow area, enhance slug flow, and form annular and wave flow easily, and the criteria for stratified flow established by the small perturbation method can distinguish the experimental flow pattern data reasonably. (2) Considering the coalescence shear between hydrate particles and combined with the effective medium theory, the calculation methods for viscosity and resistance of hydrate slurry were established with the prediction accuracy within ±20%. (3) The critical suspension flow rate of hydrate multiphase pipeline transport was proposed, and the mechanism models of gas-slurry (below the critical rate) and solid-liquid (above the critical rate) multiphase flow were established respectively, which could more reasonably describe the coupling effect of hydrate particles and multiphase flow. (4) Four stages of hydrate wall deposition were observed, and through quantitative cha-racterization and analysis of hydrate deposition rates under different experimental conditions, the mechanism of various factors on hydrate wall deposition was revealed. (5) The coalescence and deposition state of hydrate particles in different flow patterns were analyzed quantitatively, and the plugging mechanism and risks of hydrate particles in different flow patterns were analyzed qualitatively. (6) By introducing the reliability theory, the limit state equation based on the hydrate volume fraction was established, and coupled sampling and rapid solution methods, the hydrate plug probability of the multiphase transport pipeline could be predicted, and the classification principle of the safety evaluation for hydrate slurry pipeline were addressed. In conclusion, the theory and technology of multiphase flow involving hydrate plugging risks can effectively predict the

risks of hydrate formation and blockage in the multiphase pipelines from both qualitative and quantitative aspects, which is not only the fundamental theory for the application of hydrate slurry transportation technology, but the key to the subsea multiphase flow assurance in the deep-water oil and gas development.
Number of references: 31
Main heading: Gas hydrates
Controlled terms: Aerodynamics - Coalescence - Deposition rates - Equations of state - Flow patterns - Hydration - Hydrodynamics - Multiphase flow - Oil field development - Perturbation techniques - Petroleum transportation - Pipelines - Reliability theory - Risks - Safety engineering - Suspensions (fluids) - Thermal stratification
Uncontrolled terms: Effective medium theories - Experimental conditions - Limit state equations - Multiphase pipelines - Multiphase transport - Risk prevention and controls - Small perturbation method - Transportation system
Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 631.1 Fluid Flow, General - 651.1 Aerodynamics, General - 801.3 Colloid Chemistry - 804 Chemical Products Generally - 914 Safety Engineering - 914.1 Accidents and Accident Prevention - 921 Mathematics - 922.2 Mathematical Statistics
DOI: 10.3787/j.issn.1000-0976.2020.12.015
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

31. Sequence sedimentary models of Oligocene Yacheng Formation in the southern uplift belt of the Qiongdongnan Basin

Accession number: 20210309770836
Title of translation:
Authors: Fu, Heng (1); Kuang, Mingzhi (2); He, Xiaohu (3); Wang, Wenbo (1); Liao, Qifeng (1); Li, Xingwang (1)
Author affiliation: (1) College of Energy, Chengdu University of Technology, Chengdu; 610059, China; (2) School of Energy Resources, China University of Geosciences, Beijing; 100083, China; (3) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the southern uplift belt of the Qiongdongnan Basin, major breakthroughs in natural gas exploration have been continuously made in the pre-Paleogene buried hill bedrock reservoirs and Oligocene Yacheng Formation sandstone reservoirs in recent years. Therefore, the sequence stratigraphy, sedimentary provenance and sedimentary facies distribution under the sequence framework of the Yacheng Formation in the southern uplift belt are studied based on the latest drilling and seismic data. The study results were achieved as follows. (1) There are three third-order sequences in the Yacheng Formation of the southern uplift belt. Each third-order sequence is controlled by the third-order sea-level change, forming a periodical transgressive system tract and a highstand system tract. The lowstand system tract mainly transforms the highstand system tract of the old sequences. (2) The Yacheng Formation has the characteristics of multiple depocenters and multiple provenances. In each sag, fan delta-continental shelf deposits with wide facies belt are developed on the gentle slope, and subsea fan-continental shelf deposits with narrow facies belt are developed on the steep slope. (3) There are three sequence depositional models in the Yacheng Formation of the southern uplift belt: transgressive system tract, highstand system tract and lowstand system tract. (4) The basement of pre-Paleogene buried hill granite in the southern uplift belt suffered long-term exposure and denudation, and the ancient uplift formed important buried-hill granite reservoir. The Yacheng Formation remains a larger area of fan delta sand bodies that were denuded and reformed during the low stand stage, forming sandstone

reservoirs with a certain scale. It is concluded that the research results can provide basis for studying the distribution law of clastic reservoirs in the Yacheng Formation in this area.
Number of references: 17
Main heading: Sedimentology
Controlled terms: Deposits - Granite - Offshore gas fields - Petroleum prospecting - Sandstone - Sea level - Seismology - Stratigraphy
Uncontrolled terms: Continental shelves - Depositional models - Lowstand system tracts - Natural gas exploration - Sandstone reservoirs - Sedimentary provenance - Sequence stratigraphy - Third-order sequences
Classification code: 471.1 Oceanography, General - 481.1 Geology - 482.2 Minerals - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields
DOI: 10.3787/j.issn.1000-0976.2020.12.003
Compendex references: YES
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32. Dynamic characteristics of production pump valve under the working conditions of low submergence and high inclination well sections

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Title of translation:
Authors: Liu, Xinfu (1, 2); Liu, Chunhua (3); He, Hongming (1, 2); Zhou, Chao (4); Wang, Dexiang (1, 2)
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Corresponding author: Liu, Chunhua(20090053@upc.edu.cn)
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Language: Chinese
ISSN: 10000976
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: At present, the mechanical behaviors of the pump valve of sucker rod pump in coal measure gas wells are studied mainly by transplanting and referring to the analysis methods for the pump valve of sucker rod pump in conventional oil and gas wells, which mostly focus on the oil and wells with higher submergence depth without taking into account the influences of pump valve dynamics and hydraulic friction under the working conditions of low submergence depth and high inclination well section or defining the specific conditions for the smooth start up of the pump valve in horizontal wells. In this paper, the differential equation set for the movement of the pump valve in the kick off section with the well fluid was derived by comprehensively considering the coupling influences of low submergence depth and high inclination. Then, the mathematical model for the hydraulic friction of fluid while it flows through the clearance of pump valve in the sucker rod pump was established. Finally, the dynamics, hydraulic friction and critical submergence depth of the pump valve in horizontal wells were analyzed based on numerical simulation methods. And the following research results were obtained. First, under the coupling action of low submergence depth and high inclination, the increase of stroke and frequency can lead to the increase of the lift, velocity and acceleration of the valve ball of the pump valve in the kick off section, and the reduction of the time for the acceleration to reach the flat value. In addition, the valve ball suffers short-term cyclical fluctuation the moment the pump valve in the horizontal well is started. Second, under the double action of spring force and valve ball gravity, the critical submergence depth of the sucker rod pump in horizontal wells is much lower than that in vertical wells, and the fixed valve ball can be reset quickly, which is beneficial to the opening of fixed and travelling valve balls in horizontal wells and the improvement of pump efficiency. Third, the increase of stroke, frequency and pump diameter can increase the critical submergence depth and the hydraulic friction of fluid while it flows through the pump valve of sucker rod pump in the horizontal well.

In addition, increasing stroke is more beneficial to increase the pump inlet velocity of low-rate well fluid while the critical submergence depth is increased significantly. In conclusion, the research results are of great significance to ensuring the continuous and stable production of coal measure gas wells and improving the reliability of sucker rod pumps.
Number of references: 23
Main heading: Oil well pumps
Controlled terms: Coal industry - Differential equations - Flow of fluids - Friction - Gas industry - Horizontal wells - Natural gas well production - Natural gas wells - Numerical methods - Pumps - Valves (mechanical)
Uncontrolled terms: Conventional oil and gas - Critical submergences - Dynamic characteristics - High inclination well - Hydraulic friction - Mechanical behavior - Numerical simulation method - Travelling valves
Classification code: 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 524 Solid Fuels - 601.2 Machine Components - 618.2 Pumps - 631.1 Fluid Flow, General - 921.2 Calculus - 921.6 Numerical Methods
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Compendex references: YES
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33. A new method for evaluating the unstable deliverability of gas wells in gas formation testing phase

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Title of translation:
Authors: Feng, Xi (1); Peng, Xian (1); Li, Qian (1); Zhao, Xiaoliang (2); Zhang, Ping (3); Pan, Deng (4)
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Abstract: Predicting the deliverability change laws of a gas well in the early stage is one of the technical difficulties in natural gas development. The commonly used steady seepage analysis methods have relatively large errors. And this problem cannot be solved effectively by the classical methods of production decline analysis and pressure transient well test analysis. To solve this problem, this paper did calculation based on the well testing model of constant-pressure production, changed the previous approximate method of simplifying the calculation of the exponential integral function, and accurately calculated the analytical solution of absolute open flow potential of a gas well. In addition, the deliverability instability characteristics of different types of gas wells were quantitatively described by taking vertical wells in homogeneous reservoirs as the reference benchmark. Then, combined with the deliverability evaluation needs of a new well, a new practical method focusing on solving the problems of gas formation testing analysis was researched and developed, and also applied on site at some key wells in the hot spots of natural gas development in the Sichuan Basin. And the following research results were obtained. First, the accurate formula for the analytical solution of well testing model significantly enhances the adaptability to shortterm test conditions. Second, the newly established chart briefly reveals the quantitative relationship between the unstable deliverability characteristics of a gas well and the main influencing factors. Third, if the characteristic parameter of turbulence effect is unknown, it is necessary to perform iterative calculation of the variable skin factor when the well testing model of constant-pressure production is used to analyze the change trend of the absolute open flow potential of a gas well. Fourth, by conducting comparative analysis on the calculation results of typical cases, the decline laws of the absolute open flow potential of different types of gas wells can be understood further. It is concluded that this new method is capable of improving the

prediction accuracy of the unstable deliverability of gas wells. Therefore, it can be widely applied to the deliverability evaluation of gas wells in the exploration stage, the evaluation stage of early development and the commissioning stage of new development and production wells, which is conducive to the formulation of natural gas exploration and development decision.
Number of references: 32
Main heading: Natural gas wells
Controlled terms: Analytical models - Gases - Iterative methods - Natural gas - Natural gas well production - Petroleum prospecting - Petroleum reservoir evaluation - Well testing
Uncontrolled terms: Absolute open flow potential - Exponential integral functions - Instability characteristics - Iterative calculation - Natural gas development - Natural gas exploration - Production decline analysis - Technical difficulties
Classification code: 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 921 Mathematics - 921.6 Numerical Methods
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34. Comparison of environmental and ecological effects between gas-fired and ultra-low emission coal-fired power generation plants

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Authors: Fan, Hui (1); Duan, Tianyu (1); Zhu, Boqi (1); Chen, Shuangying (2)
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Abstract: Whether gas-fired power generation still has the comparative advantages in en-vironmental protection and ecology compared with ultra-low emission (ULE) coal-fired power generation is an important factor to be considered in domestic power structure optimization decision in the future. Based on existing environmental protection standard of domestic fossil-fuel industry, this paper compared the environmental and ecological effects of gas-fired power generation with that of ULE coal-fired power generation from the aspects of pollutant emission level, issues caused by pollutants control, carbon emission and resource consumption. And the following research results were obtained. First, after low-nitrogen combustion modification and SCR in-stallation are implemented in gas-fired power generation, its emission of con-ventional pollutants is much lower than that of ULE coal-fired power generation. Second, CO2 emission per kilowatt hour of gas-fired power generation is about 50% lower than that of ULE coal-fired power generation. By means of gas-fired power generation, water and land resources can be saved greatly. Third, ULE coal-fired power generation suffers the emission problems of condensable particles (SO3) and heavy metals, so gas-fired power generation is much more advantageous in terms of environmental protection and ecological effect. Finally, several development suggestions were proposed. First, intensify environmental policies continuously and encourage the construction of gas-fired power generation plants. Second, by referring to NOx emission standard of gas turbines in Beijing and Shenzhen, revise the "Air Pollutant Emission Standard of Fossil-Fuel Power Plants (GB 13223-2011)" and set domestic NOx emission limit of gas turbines at 15 mg/m3 and cancel dust and SO2 emission limits of gas turbine. Third, accelerate the construction and improvement of national carbon market and set the "floor price", establish a climate-friendly market environment of fair competition by virtue of carbon price mechanism, and speed up the transformation of electric power enterprises to the low-carbon power structure.
Number of references: 24

Main heading: Gas turbine power plants
Controlled terms: Air pollution - Carbon - Coal - Coal combustion - Coal deposits - Coal industry - Commerce - Competition - Environmental protection - Fossil fuel power plants - Gas turbines - Gases - Heavy metals - Nitrogen oxides - Structural optimization
Uncontrolled terms: Air pollutant emission - Coal-fired power generation - Coal-fired power generation plant - Combustion modification - Comparative advantage - Electric power enterprise - Environmental protection standards - Power generation plants
Classification code: 451 Air Pollution - 454.2 Environmental Impact and Protection - 503 Mines and Mining, Coal - 524 Solid Fuels - 531 Metallurgy and Metallography - 612.3 Gas Turbines and Engines - 804 Chemical Products Generally - 804.2 Inorganic Compounds - 911.2 Industrial Economics - 921.5 Optimization Techniques
Numerical data indexing: Mass_Density 1.50e-05kg/m3, Percentage 5.00e+01%
DOI: 10.3787/j.issn.1000-0976.2020.07.018
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

35. Characteristics, genetic mechanism and oil & gas exploration significance of high-quality sandstone reservoirs deeper than 7 000 m: A case study of the Bashijiqike Formation of Lower Cretaceous in the Kuqa Depression

Accession number: 20200908220991
Title of translation: 7 000 m, -
Authors: Zeng, Qinglu (1, 2); Mo, Tao (3); Zhao, Jilong (1, 2); Tang, Yongliang (3); Zhang, Ronghu (1, 2); Xia, Jiufeng (1, 2); Hu, Chunlei (3); Shi, Lingling (3)
Author affiliation: (1) PetroChina Hangzhou Institute of Geology, Hangzhou; Zhejiang; 310023, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (3) Exploration and Development Research Institute, PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
Source title: Natural Gas Industry
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Publication year: 2020
Pages: 38-47
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Ultra-deep clastic reservoirs generally have poor physical properties and low single-well productivity, but Well Bozi 9, which is newly drilled in the Kuqa Depression of the Tarim Basin, encounters a thick high-quality reservoir in the Bashijiqike Formation of Lower Cretaceous deeper than 7 600 m and produces a high-yield industrial gas flow. In order to reveal the characteristics and genesis of the Bashijiqike Formation reservoir and reduce the exploration risk of ultra-deep oil and gas layers, we discussed its characteristics, genetic mechanism and oil & gas exploration significance based on cores, logging and experimental analysis, combined with regional temperature-pressure conditions and burial evolution history. And the following research results were obtained. First, the rock types of ultra-deep reservoir of Bashijiqike Formation in this area are medium- and fine-grained feldspathic litharenite and lithic arkose with point-line contact between grains, and its reservoir space is dominated by primary intergranular pores. At present, it is still at its middle diagenetic stage. Second, different from other ultra-deep fractured low-porosity sandstone reservoirs, this set of ultra-deep reservoir is a pore-type reservoir with a porosity of 4-13%, the permeability of 0.1-50.0 mD and good porosity and permeability correlation. Third, during the sedimentation of Bashijiqike Formation, thick sand bodies of delta front were widely developed, medium and fine sandstones accounted for more than 85% and grains had strong compressive capacity. After that, this reservoir experienced long-term shallow burial in the early-medium stage and rapid deep burial in the late stage and the burial compaction effect was weaker. In the late stage, a canopy structure was formed from the overlying Paleogene thick gypsum salt bed due to thrust and compression, and it further suppressed vertical compaction. In the meantime, the study area was far from the orogenic belt and the structural transition zone, so the lateral compressive stress was weak. Therefore, the primary intergranular pores were preserved in large quantities. It is concluded that coarse lithology, weak compaction and low tectonic stress are the key factors to the development of this ultra-deep high-quality reservoir. In addition, the

development of large-scale effective reservoirs deeper than 7 000 m provides favorable material conditions for the high-abundance enrichment of natural gas and the reserves of trillion cubic meters in the Kuqa Depression, and the oil and gas exploration potential is huge.
Number of references: 29
Main heading: Low permeability reservoirs
Controlled terms: Compaction - Flow of gases - Gases - Geological surveys - Lithology - Oil wells - Petroleum reservoir engineering - Porosity - Proven reserves - Risk assessment - Sandstone - Textures
Uncontrolled terms: Deeper than 7 000 m - Early Cretaceous - Formation mechanism - Gas exploration - Kuqa depression - Sandstone reservoirs - Tarim Basin - Ultra deeps
Classification code: 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 631.1.2 Gas Dynamics - 914.1 Accidents and Accident Prevention - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Percentage 4.00e+00% to 1.30e+01%, Percentage 8.50e+01%, Size 7.00e+03m, Size 7.60e+03m
DOI: 10.3787/j.issn.1000-0976.2020.01.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

36. Formation mechanisms of deep and ultra-deep overpressure cap rocks and their relationships with super large gas fields in the petroliferous basins of China

Accession number: 20201208318036
Title of translation: ,
Authors: Li, Wei (1); Yu, Ziliang (2); Wang, Xueke (1); Yu, Zhichao (1); Lu, Xuesong (1); Feng, Qingfu (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) Beijing Research Center, CNOOC China Limited, Beijing; 100011, China
Source title: Natural Gas Industry
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Issue date: February 25, 2020
Publication year: 2020
Pages: 11-21
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Super large natural gas fields have been discovered in the deep and ultra-deep layers of onshore and offshore petroliferous basins in China since the beginning of the 21st century, and the geological conditions for the formation of these gas fields and their development laws have already been discussed in a large number of literatures, but the relationship between overpressure and the formation of this kind of gas fields is still less researched. In this regard, this paper firstly analyzed the gas reservoir development law, sealing conditions and overpressure characteristics of deep and ultra-deep super large gas fields. Then, the formation mechanisms of deep and ultra-deep overpressure cap rocks were investigated and the development law of deep and ultra-deep super large gas fields and their relationship with overpressure cap rocks were discussed. Finally, the favorable areas for the next exploration of deep and ultra-deep natural gas were pointed out. And the following research results were obtained. First, the formation of deep and ultra-deep super large gas fields is closely related to the development of overpressure cap rocks. Overpressure cap rock is a necessary condition for the formation of deep and ultra-deep super large gas fields, and there are three overpressure formation mechanisms, including pressure seal of salt-gypsum layer, pressure seal of residual uplift and pressure seal of hydrocarbon-generating pressurization. Second, as for deep and ultra-deep overpressure cap rocks and super large gas fields, there are four reservoir-cap rock assemblage modes under different pressure environments, i.e., overpressure salt-gypsum seal and overpressure super large gas field (type I), internal overpressure compartment and overpressure super large gas field (type II), high-pressure argillaceous shale seal at the bottom of overpressure compartment and normal-pressure super larger gas field (type III), and overpressure source rock seal and normal-pressure super larger gas field (type IV). In conclusion, there are type I super large gas fields in the Kuqa Depression of the Tarim Basin, types II and III in the Junggar Basin, types I - IV in the Sichuan Basin and type IV in the Bohai Bay Basin.
Number of references: 61

Main heading: Offshore gas fields
Controlled terms: Barium compounds - Gases - Gasoline - Gypsum - Landforms - Natural gas - Offshore oil well production - Petroleum reservoirs - Rocks - Seals
Uncontrolled terms: Bohai Bay Basin - Cap rock - Deep layer - Formation mechanism - Junggar Basin - Large gas field - Sichuan Basin - Tarim Basin - Ultra deeps
Classification code: 481.1 Geology - 482.2 Minerals - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 523 Liquid Fuels - 619.1.1 Pipe Accessories
DOI: 10.3787/j.issn.1000-0976.2020.02.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

37. Failure control and integrity technologies of tubing/casing string under complicated working conditions: Research progress and prospect

Accession number: 20201208317924
Title of translation:
Authors: Feng, Yaorong (1); Fu, Anqing (1); Wang, Jiandong (1); Wang, Peng (1); Li, Dongfeng (1); Yin, Chengxian (1); Liu, Hongtao (2)
Author affiliation: (1) State Key Laboratory of Performance and Structure Safety for Petroleum Tubular Goods and Equipment Materials, CNPC Tubular Goods Research Institute, Xi'an; Shaanxi; 710077, China; (2) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
Corresponding author: Fu, Anqing(fuanqing@cnpc.com.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: As the exploration and development of deep carbonate reservoirs, new areas and shale oil and gas is strengthened, the stratigraphic conditions and the medium environments of oil and gas fields become more complex and demanding, and failure accidents happen from time to time, such as tubing/casing string deformation, connection leaking, collapse and fracturing. In addition, wells with special structure and special process and the special stimulation measures ask for new requirements on tubing/casing string. As a result, tubing/ casing string is faced with a series of new challenges and difficulties. After over 10 years' research, a series of experimental research progresses and important technological achievements have been obtained to meet the urgent need of reserves and production increase of domestic oil and natural gas industry and solve the technological difficulties of frequent tubing/casing string failure under complicated working conditions, e.g. deep and ultra-deep wells, wells with special structure and special process, and repeated acidizing fracturing of strong acid/high displacement and high-pressure. And these achievements are mainly as follows. First, corrosion material selection and evaluation of tubing/casing pipe, corrosion control and integrity technology of casing/tubing string based on the whole life cycle of a gas well is formed. Second, reliability design & evaluation and supporting technologies for the threaded connection structure and seal of tubing and casing are developed. Third, the casing string technology of "API long round threaded casing + CATTS101 advanced thread compound" suitable for the cost-effective efficient development of low-permeability tight gas wells is researched and developed. Fourth, the test platform and evaluation technology for the structure and seal integrity of casing/tubing string under complicated working conditions (e.g. high temperature and high pressure) are established. Then, based on domestic new needs and new problems in strengthening the exploration and development of oil and gas, some suggestions were proposed on continuing to carry out the research on failure control and integrity of casing/tubing string under complicated working conditions (such as deep layer, acidic environment and shale gas). In conclusion, these technological achievements provide powerful support for the cost-effective development of important oil and gas fields in China.
Number of references: 30
Main heading: Oil field equipment

Controlled terms: Accidents - Cost effectiveness - Failure (mechanical) - Fracturing (fossil fuel deposits) - Gas industry - Gas permeability - Gases - Life cycle - Natural gas wells - Oil field development - Oil well production - Petroleum industry - Petroleum reservoir evaluation - Petroleum reservoirs - Pipeline corrosion - Proven reserves - Reserves to production ratio - Seals - Stratigraphy - Tight gas - Tubing - Well stimulation
Uncontrolled terms: Casing - Complex working condition - Corrosion control - Failure controls - Full scale tests - Integrity assessment - Premium connection
Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512 Petroleum and Related Deposits - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 619.1.1 Pipe Accessories - 911.2 Industrial Economics - 914.1 Accidents and Accident Prevention - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.02.012
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

38. Calculation and experimental studies on the collapse strength of titanium alloy tubing and casing

Accession number: 20210109725838
Title of translation:
Authors: Liu, Qiang (1); Shen, Zhaoxi (1); Li, Dongfeng (1); Zhang, Chunxia (2); Zhu, Guochuan (1); Song, Shengyin (1)
Author affiliation: (1) State Key Laboratory of Performance and Structural Safety for Petroleum Tubular Goods and Equipment Materials, CNPC Tubular Goods Research Institute, Xi'an; 710077, China; (2) Baosteel Tube & Pipe Plant, Shanghai; 201900, China
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Publication year: 2020
Pages: 94-101
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Titanium alloy has become a promising candidate material for oil country tubular goods (OCTG) in rigorous service environment and for offshore oil and gas development tools, owing to its high specific strength, low elastic modulus and excellent toughness, fatigue and corrosion resistance. However, the collapse strength of titanium alloy tubing and casing which is calculated by means of the tubing and casing collapse calculation method stipulated in API and ISO standard systems lacks verification. Taking the manufacturing defects into consideration, this paper clarified the change laws of the collapse strength of titanium alloy tubing and casing by comparing such collapse strength calculated by three calculation methods (i.e. the calculation method in ISO 10400 standard, the calculation in the Strength Collapse Rule and the finite element simulation) and the calculation results with the collapse strength of steel tubing and casing under the same condition. Finally, the change laws were verified by selecting four types of titanium alloy tubing and casing for full-scale collapse test. And the following research results were obtained. First, the collapse strength of titanium alloy tubing and casing decreases with the increase of the diameter-to-thickness ratio (D/t). When the D/t value is low, there is little difference between the collapse strength of titanium alloy tubing and casing and that of steel tubing and casing. When the D/t value is high, the collapse strength of titanium alloy tubing and casing is significantly lower than that of steel tubing and casing. Second, the collapse strength of titanium alloy tubing and casing calculated by the method in the Strength Collapse Rule is closer to the actual test value. And the calculation result at D/t >15 shall be multiplied by the coefficient of 0.9, so as to ensure better safety. In conclusion, the research results can provide technical reference for the design, utilization and management of titanium alloy tubing and casing. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 24
Main heading: Titanium alloys
Controlled terms: Corrosion resistance - Corrosion resistant alloys - High strength alloys - ISO Standards - Offshore oil well production - Tubing

Uncontrolled terms: Candidate materials - Diameter-to-thickness ratios - Finite element simulations - High specific strength - Low elastic modulus - Manufacturing defects - Oil country tubular goods - Service environment
Classification code: 511.1 Oil Field Production Operations - 531.1 Metallurgy - 539.1 Metals Corrosion - 542.3 Titanium and Alloys - 619.1 Pipe, Piping and Pipelines
DOI: 10.3787/j.issn.1000-0976.2020.10.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

39. Characterization of channel sand body and its reservoir physical properties based on seismic amplitude energy: A case study of the Middle Jurassic Shaximiao Formation in the central Sichuan Basin

Accession number: 20210109725850
Title of translation: -
Authors: Gan, Dayong (1); Huang, Tianjun (1); Lyu, Yan (1); Yang, Guangguang (1); He, Changlong (1); Xia, Xiaoyong (1); Wu, Changjiang (1); Xi, Cheng (1); Yu, Yi (1)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610041, China
Source title: Natural Gas Industry
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Pages: 38-43
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Middle Jurassic Shaximiao Formation in the central Sichuan Basin is a delta front deposit with developed underwater distributary channel sand body, and it is a new field of unconventional gas exploration and development in this area. In order to support the deployment of natural gas exploration in this area, this paper researched the key technologies for the exploration and development of tight sandstone gas. Based on forward modeling of the wave equation of channel sand body, the boundary of the channel sand body was identified by means of multi-attribute fusion, and then combined with the "bright spot" of strong seismic amplitude, the channel sand body was depicted. Finally, the distribution law of high quality reservoir was predicted by calculating the amplitude energy of channel sand body and analyzing the correlation with the reservoir physical property of channel sand body. And the following research results were obtained. First, No.8 sand body combination of Shaximiao Formation in this area presents continuous and stable distribution along the strike direction of river channel in the seismic profile, and its seismic response characteristics are "bright spot" reflection characteristics of "strong wave trough at the top boundary of sand body and strong wave peak at the bottom boundary". Second, it is predicted that the channel in No.8 sand body combination of Shaximiao Formation in this area is 600-1 400 m in width and 67.22 km2 in area. Third, in the range of the seismic tuning thickness of channel sandstone, the seismic amplitude energy of sand body is in a linear positive correlation with its physical property. The better the physical property is, the stronger the amplitude energy is. As the thickness and porosity of the sand body increase, it is easier to identify the seismic "bright spot" pattern of the sand body. In conclusion, the amplitude energy of channel sand body is more than 80% correlated with the physical property of sand body, and can reflect the physical property of channel sand body. This research result can provide reference for subsequent well location deployment and exploration and development of unconventional natural gas.
Number of references: 16
Main heading: Sand
Controlled terms: Geological surveys - Natural gas - Natural gas wells - Petroleum prospecting - Physical properties - Sandstone - Seismology
Uncontrolled terms: Exploration and development - High quality reservoir - Natural gas exploration - Reflection characteristics - Reservoir physical property - Seismic response characteristics - Unconventional natural gas - Underwater distributary channels

Classification code: 481.1 Geology - 482.2 Minerals - 483.1 Soils and Soil Mechanics - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Area 6.72e+07m2, Percentage 8.00e+01%, Size 6.00e+02m to 1.40e+03m
DOI: 10.3787/j.issn.1000-0976.2020.10.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

40. Rock-breaking characteristics and temperature field change of cone-PDC hybrid bits

Accession number: 20201708556746
Title of translation: -PDC
Authors: Wu, Zebing (1); Lyu, Lantao (1); Wang, Yongyong (1); Pan, Yujie (1); Zhang, Shuai (1)
Author affiliation: (1) Mechanical Engineering College, Xi'an Shiyou University, Xi'an; Shaanxi; 710065, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 99-106
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Compared with a conventional PDC bit or a cone bit, a cone-PDC hybrid bit is better in rock breaking effect. The heat generated in the process of its rock breaking has a significant effect on its service life and drilling efficiency. So far, however, the temperature fields and rock breaking characteristics in the process of its rock breaking have not been researched thoroughly. In order to provide a theoretical support for the optimization and popularization of a hybrid bid, this paper established a rock-breaking simulation model based on finite element analysis method, elastic-plastic mechanics, etc. And based on this, temperature field change laws and rock breaking characteristics of the hybrid bit in the process of rock breaking were analyzed. And the following research results were obtained. First, when a cone-dominated hybrid bit is used for rock breaking, the rolling cutter firstly impacts the rock to generate breaking pit and then PDC cogging carries out shearing. And when the PDC-dominated hybrid bit is used, the PDC cogging creates grooves by conducting scraping and then the rolling cutter breaks the rock. Second, the temperature of a hybrid bit rises rapidly in the initial stage of rock breaking, and after a while it tends to be stable and the temperature increases with the increase of the weight on bit (WOB). Third, compared with a PDC bit or a cone bit, a hybrid bit has a lower temperature in the process of rock breaking. The rock-broken volume of the hybrid bit is larger than the sum of a single PDC bit and a single cone bit. Fourth, the rock breaking temperature of a hybrid bit in hard strata is higher than that in soft strata, while the resulted rate of penetration (ROP) is opposite. Fifth, a bit's rock breaking temperature and rock breaking characteristics are related to its own structure. In conclusion, the research results are conducive to the design optimization, popularization and application of hybrid bits. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 24
Main heading: Rocks
Controlled terms: Bits - Diamond drills - Elastoplasticity - Temperature
Uncontrolled terms: Design optimization - Drilling efficiency - Finite element analysis method - Lower temperatures - Rate of penetration - Simulation model - Temperature field change - Temperature increase
Classification code: 603.2 Machine Tool Accessories - 641.1 Thermodynamics
DOI: 10.3787/j.issn.1000-0976.2020.03.012
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

41. Construction of China's oil & gas exploration and development supervision system under the new situation

Accession number: 20200908220918
Title of translation:
Authors: Tang, Guoqiang (1, 2); Xu, Dong (2, 3); Fu, Di (2); Liu, Tao (4)
Author affiliation: (1) China University of Petroleum, Beijing, Beijing; 102249, China; (2) PetroChina Planning and Engineering Institute, Beijing; 100083, China; (3) Tianjin University, Tianjin; 300072, China; (4) China Petroleum Materials Procurement Center, Beijing; 100029, China
Corresponding author: Xu, Dong(xudong@petrochina.com.cn)
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Abbreviated source title: Natur. Gas Ind.
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Pages: 141-151
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Some Opinions on Deepening Reform of Oil and Natural Gas System issued by the state proposes that an oil and natural gas system with orderly competition, legal compliance and effective supervision be established. At present, however, China's oil & gas exploration and development field lacks independent supervision and regulation. And its supervision functions are absent or scattered, its supervision work needs to be improved and its supervision power is seriously insufficient, which restricts the healthy and efficient development of oil and gas industry. In view of this, the reform history and management and supervision status of China's oil and gas industry were systematically investigated. Then, combined with the main enlightenments of foreign oil & gas exploration and development supervision, the following suggestions were proposed to improve domestic oil & gas exploration and development supervision system. First, government management institutions and functions should be gradually rationalized; oil & gas exploration and development supervision methods should be optimized; relatively independent professional regulatory agencies should be established and a hierarchical supervision system with clear powers and responsibilities and coordination and cooperation should be constructed. Second, the construction of oil & gas exploration and development supervision system shall adhere to ten basic principles, such as coordinating and promoting the reform of government functions, serving the industrial development and energy strategic goals and forming a diversified supervision system. Third, a modern supervision system of "clear laws, well-defined power and responsibility, efficiency and transparence, openness and fairness, and multi-participation" should be constructed, with the supervision operation focusing on three aspects, i.e., safety and production supervision, market supervision and industry regulation. Fourth, the construction of the institutional mechanism of regulatory agencies shall follow the basic ideas of "short board complementation and function enhancement" in the 13th Five-Year Plan period, "mechanism construction and separation promotion" in the earlier stage of 14th Five-Year plan period, and "large department system and hierarchical supervision" in the later stage of 14th Five-Year Plan period. Fifth, special reform leading groups and working groups should be set up to improve the system of laws, regulations and rules, and comprehensively coordinate the relationship between the governments of all levels and the industry sectors, producers and consumers, giving full play to the supervision of oil and gas companies and industry associations.
Number of references: 24
Main heading: Petroleum prospecting
Controlled terms: Accident prevention - Gas industry - Gases - Geological surveys - Laws and legislation - Natural gas - Natural gasoline plants - Oil field development - Petroleum industry - Public utilities
Uncontrolled terms: Coordination and cooperation - Diversified supervision - Gas exploration - Hierarchical supervision - Large department system - Reform
Classification code: 481.1 Geology - 512.1.2 Petroleum Deposits : Development Operations - 513.2 Petroleum Refineries - 522 Gas Fuels - 914.1 Accidents and Accident Prevention - 971 Social Sciences
DOI: 10.3787/j.issn.1000-0976.2020.01.019
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

42. Laws of gas and water flow and mechanism of reservoir drying in tight sandstone gas reservoirs

Accession number: 20205009619838
Title of translation:
Authors: Zhao, Yulong (1); Liu, Xiangyu (1); Zhang, Liehui (1); Tang, Hongming (1); Xiong, Yu (1); Guo, Jingjing (1); Shan, Baochao (2)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; 610500, China; (2) State Key Laboratory of Coal Combustion, Huazhong University of Science and Technology, Wuhan; 430074, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The reservoir permeability of tight sandstone gas reservoirs is low, which makes it difficult to carry out displacement flow experiments on real cores underground conditions, so the microscopic flow mechanism can be hardly studied. Based on the lattice Boltzmann method (LBM), this paper simulated the flow process of formation water displaced by tight gas under the simulated reservoir conditions of high temperature and high pressure to clarify the distribution of bound water in the reservoir. Then, reservoir drying was experimentally studied using the laser etching model, and numerical simulation of reservoir drying was simplified by referring to the visualization results of the experiment. Finally, the influence of reservoir drying on the seepage capacity of tight gas was studied by means of numerical simulation. And the following research results were obtained. First, when the lattice Boltzmann model is used for high temperature and high pressure reservoirs, it satisfies the Laplace law and its numerical solution of two-phase Poiseuille flow rate is basically consistent with the analytical solution, which indicates that this model can be used to simulate gas-water immiscible displacement under reservoir conditions. Second, tight gas preferentially breaks through in large porous media connected channels, and after the breakthrough, the displacement rate of formation water decreases significantly. Third, the contact angle between formation water and rock wall has a significant influence on gas-water two-phase flow. The strong the water wettability of the rock is, the lower the displacement rate is. Fourth, the bound water in tight sandstone gas reservoirs can be classified into four types, including adsorbed water film, blind end pore water, dead pore water and trapped water. In porous media, a large number of connected micro-channels are occupied by trapped water and adsorbed water film and the phenomenon of "water lock" is obvious, which seriously influences the seepage capacity of tight gas in the porous media of reservoir. Fifth, drying agent can react with bound water to produce a large number of bubbles, which will consume adsorbed water film, trapped water and blind end pore water, so as to improve the gas seepage capacity. Sixth, in the "water lock" regions formed by trapped water, the gas seepage capacity can be effectively improved by increasing the drying strength. On the whole, the tight gas permeability increases with the increase of drying strength, but its increase amplitude decreases gradually when the drying strength exceeds a certain degree.
Number of references: 34
Main heading: Two phase flow
Controlled terms: Contact angle - Drying - Etching - Flow of water - Gas permeability - Gas permeable membranes - Gases - Hydrocarbon seepage - Low permeability reservoirs - Numerical models - Petroleum reservoir engineering - Porous materials - Produced Water - Sandstone - Tight gas
Uncontrolled terms: High temperature and high pressure - Immiscible displacement - Lattice boltzmann methods (LBM) - Lattice boltzmann models - Poiseuille flow rate - Reservoir conditions - Reservoir permeability - Visualization results
Classification code: 482.2 Minerals - 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 631.1 Fluid Flow, General - 631.1.1 Liquid Dynamics - 802.2 Chemical Reactions - 921 Mathematics - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.09.009
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Database: Compendex

Data Provider: Engineering Village

43. Dynamic characterization of microscopic pore structures of shale under the effect of hydration: A case study of Longmaxi Formation shale in the Changning area of the Sichuan Basin

Accession number: 20210109725843
Title of translation: -
Authors: Zeng, Fanhui (1); Zhang, Qiang (1); Chen, Siyu (1, 2); Guo, Jianchun (1); Fan, Yu (3); Ren, Wenxi (1); Wang, Xinghao (3)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; 610500, China; (2) Downhole Service Company, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; 610052, China; (3) Research Institute of Shale Gas, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610056, China
Source title: Natural Gas Industry
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Publication year: 2020
Pages: 66-75
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to study the effects of hydration on shale pore structure in a real fracturing environment, this paper selected the samples of Lower Silurian Longmaxi Formation shale in the Changning area of the Sichuan Basin to carry out imbibition and hydration experiments of fracturing fluid under the reservoir temperature of 90. Then, the macroscopic evolution process of pore structure parameters (e.g. morphology, size and specific surface area) of shale sample particles after hydration of 0 d, 5 d, 10 d and 20 d were compared by means of scanning electron microscopy, low-temperature N2 adsorption, high-pressure mercury injection, CT scanning and other experiments. In addition, the reasons for the change of shale pore structure were analyzed. Finally, hydration experiments were carried out on single clay mineral (montmorillonite and illite) to compare the hydration characteristics of different clay minerals. And based on this, the influencing mechanism of hydration on shale microstructure was studied. And the following research results obtained. First, clay mineral hydration can promote the generation of micro-fractures between shale bedding planes. Hydration induced fractures are of small scale and dense distribution, so they can be locally interconnected in the microscopic level to improve the physical properties of shale reservoirs significantly. Second, as hydration goes on, micro-fractures approach to closure from propagation, and the pore volume increases first and then decreases. And it reaches the maximum value after hydration of 5 days. Third, the hysteresis of clay mineral hydration swelling relative to hydration stress change is the main reason for the change of shale microstructures, and the hydration swelling volume of illite is smaller than that of montmorillonite. Fourth, inorganic cations can inhibit clay mineral hydration, and the inhibition effects of K+, Na+ and Ca2+ become worse in turn. In conclusion, hydration can increase the permeability of shale reservoirs, and the reasonable soak time after the fracturing of Longmaxi Formation shale reservoirs in the study area is 5 days. As for the shale gas reservoirs with higher montmorillonite contents, however, it is recommended to extend the soak time appropriately. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 20
Main heading: Clay minerals
Controlled terms: Computerized tomography - Fracturing fluids - Hydration - Morphology - Petroleum reservoir engineering - Petroleum reservoirs - Pore structure - Scanning electron microscopy - Temperature
Uncontrolled terms: Dynamic characterization - High pressure mercury - Hydration characteristics - Hydration experiments - Influencing mechanisms - Microscopic pore structures - Reservoir temperatures - Shale gas reservoirs
Classification code: 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 641.1 Thermodynamics - 723.5 Computer Applications - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Age 1.37e-02yr
DOI: 10.3787/j.issn.1000-0976.2020.10.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

44. A comprehensive logging evaluation method of shale gas reservoir quality

Accession number: 20201208317054
Title of translation:
Authors: Zhong, Guanghai (1, 2); Chen, Liqing (1); Liao, Maojie (1); Wang, Guangyao (1); Yang, Yang (1); Gao, Xiang (1)
Author affiliation: (1) Research Institute of Shale gas, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610041, China; (2) Shale Gas Evaluation and Exploitation Key Laboratory of Sichuan Province, Chengdu; Sichuan; 610041, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: February 25, 2020
Publication year: 2020
Pages: 54-60
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: As a crucial factor for reservoir fracturing reconstruction, the quality of a shale reservoir could directly affect the optimization of a testing zone, the effectiveness of fracturing operation, and the level of shale gas test productivity. To this end, a case study was made on the comprehensive evaluation of marine shale reservoirs in the southern Sichuan. First, through correlation analysis of core laboratory data and well logging curves, uranium content and density curves were chosen to calculate the total organic carbon, acoustics, density and uranium curves to calculate reservoir porosity and organic porosity, and a multi-parameter model for calculating shale reservoir parameters was thus established with high precision. Second, based on the principal component method analysis between reservoir parameters and single-stage test production in horizontal wells, shale porosity, total organic carbon, brittleness index and total gas content were chosen to establish a comprehensive evaluation model for horizontal wells in shale reservoirs, and to set up a comprehensive method to evaluate shale quality by using log data, from which evaluation results and production logging results were found to have a good correspondence. This study suggests that acoustics curves can better characterize inorganic porosity, while uranium content can better characterize organic shale porosity; and that a horizontal well target should be controlled as far as possible in the single layer with a high brittle mineral content and a high brittle index, i. e., easier to be fractured and more complex fractures to be formed, the greater the contribution of test production. It is concluded that the logging evaluation method of a shale gas horizontal well could precisely indicate the quality of shale reservoirs, providing a technical support for target optimization of field horizontal wells and fracturing section optimization of high quality shale reservoirs, and effectively guide field production and development practices.
Number of references: 17
Main heading: Quality control
Controlled terms: Acoustic logging - Brittleness - Fracture - Fracture mechanics - Gases - Horizontal wells - Marine engineering - Mineral industry - Organic carbon - Petroleum reservoir evaluation - Petroleum reservoirs - Plasticity - Porosity - Shale gas - Uranium
Uncontrolled terms: Gas content - Marine shales - Organic carbon contents - Reservoir quality - Sichuan Basin
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 547 Minor, Precious and Rare Earth Metals and Alloys - 675 Marine Engineering - 751.2 Acoustic Properties of Materials - 804.1 Organic Compounds - 913.3 Quality Assurance and Control - 931.1 Mechanics - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.02.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

45. Analysis on the mechanical behavior of sandwich pipes in the reeling and straightening stage of reel-lay installation

Accession number: 20210309770852
Title of translation:

Authors: Liu, Shujie (1); Huang, Yi (1); Meng, Wenbo (1); Jiang, Donglei (1); Liu, Hexing (1); Li, Mingliang (2); Gao, Yonghai (2); Fu, Guangming (2, 3)
Author affiliation: (1) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China; (2) School of Petroleum Engineering, China University of Petroleum-East China, Qingdao; 266580, China; (3) LTS/COPPE/UFRJ, Rio de Janeiro, Brazil
Corresponding author: Fu, Guangming(fu@upc.edu.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 12
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Publication year: 2020
Pages: 143-150
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Sandwich pipes with both functions of pressure resistance and thermal insulation is the potential ideal solution in deepwater oil and gas transportation, but residual stress and plastic strain induced by reel-lay installation are two important factors affecting the bearing capacity of sandwich pipe. In order to analyze the variation laws of residual stress and plastic strain caused in the reeling and straightening process of reel-lay installation, a numerical model was established for the reel-lay installation of offshore deepwater sandwich pipe. And its accuracy was verified by using the laboratory full-scale experimental results. Then, the stress-strain variation laws of the deepwater sandwich pipe in the process of reel-lay installation, the section ovality variation of the sandwich pipe and the accumulation of equivalent plastic strain after the installation straightening were analyzed by using the finite element model. Finally, the influences of steel pipe wall thickness and interlayer adhesion behavior of the sandwich pipe on the mechanical behavior during the reel-lay installation were discussed by means of parametric analysis. And the following research results were obtained. First, the error between the plastic strain in the reeling and the straightening stage of the sandwich pipe calculated on the basis of the numerical analysis model which is established for the reel-lay installation of the sandwich pipe and the experimental results is 0.7% and 0.5%, respectively, which proves that this model meets the requirement of calculation accuracy. Second, in the reeling and straightening process of the sandwich pipe, its interlayer contact performance has little influence on axial and circumferential plastic strain. Third, the steel pipe wall thickness of the sandwich pipe has little interference on its axial plastic strain, but its influence on the circumferential plastic strain of the outer steel pipe is more obvious. Fourth, the straightening process has a significant influence on the ovality of the sandwich pipe and its influence degree increases with the increase of wall thickness of the outer steel pipe. Besides, a certain amount of plastic strain accumulates in the process of reel-lay installation, which influences the bearing resistance capacity of the sandwich pipe. In conclusion, the established numerical model can be used to analyze the mechanical behavior of a sandwich pipe in the process of reel-lay installation, and it provides technical support for calculating the bearing capacity of a sandwich pipe while considering the influence of installation defects.
Number of references: 21
Main heading: Plastic pipe
Controlled terms: Bearing capacity - Bearings (machine parts) - Installation - Numerical models - Offshore oil well production - Offshore pipelines - Petroleum transportation - Plastic deformation - Reels - Residual stresses - Steel pipe - Straightening machines - Thermal insulation
Uncontrolled terms: Calculation accuracy - Equivalent plastic strain - Interlayer adhesion - Numerical analysis models - Parametric -analysis - Pipe wall thickness - Pressure resistance - Straightening process
Classification code: 413.2 Heat Insulating Materials - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 535.2.1 Metal Forming Machines - 545.3 Steel - 601.2 Machine Components - 619.1 Pipe, Piping and Pipelines - 691.2 Materials Handling Methods - 921 Mathematics
Numerical data indexing: Percentage 5.00e-01%, Percentage 7.00e-01%
DOI: 10.3787/j.issn.1000-0976.2020.12.016
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

46. Technologies for the efficient development of tight sandstone gas reservoirs in narrow channels: A case study of Middle Jurassic Shaximiao Formation gas reservoir in the Zhongjiang Gas Field of western Sichuan Basin

Accession number: 20202508845038
Title of translation: -
Authors: Duan, Yongming (1); Zeng, Yan (2); Liu, Chengchuan (1); Chen, Jun (1); Bi, Youyi (1); Liu, Bin (3)
Author affiliation: (1) Exploration and Development Research Institute, Sinopec Southwest Oil & Gas Company, Chengdu; Sichuan; 610051, China; (2) Sinopec Southwest Oil & Gas Company, Chengdu; Sichuan; 610051, China; (3) Engineering Technology Institute, Sinopec Southwest Oil & Gas Company, Deyang; Sichuan; 618000, China
Corresponding author: Chen, Jun(1009731503@qq.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 5
Issue date: May 25, 2020
Publication year: 2020
Pages: 58-65
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The gas reservoir of Middle Jurassic Shaximiao Formation in the Zhongjiang Gas Field of western Sichuan Basin is characterized by complex structure and strong heterogeneity, which brings great challenges to its efficient development. In this paper, a series of technologies suitable for the efficient development of tight sandstone gas reservoirs in narrow channels were researched and developed. And they have been practically applied to the gas reservoir of Middle Jurassic Shaximiao Formation in the Zhongjiang Gas Field of western Sichuan Basin. And the following application results were obtained. First, the multi-domain and multi-attribute fine description technology is suitable for the complex and narrow channel sand bodies. By virtue of this technology, the spatial distribution characteristics of multi-stage overlapping channel sand bodies are described well, and the sedimentary time sequence of each channel sand body is also defined very clearly. Second, by virtue of the "three-phase" quantitative prediction technology of lithofacies, physical facies and fluid facies, the high-precision quantitative prediction of thin-layer lithofacies and physical facies is realized, the channel sand body with a thickness of 5-8 m can be identified, with a coincidence rate of lithology predictionbeing close to 100%, and the error of predicted reservoir thickness and porosity being less than 10%. Third, it is expected to obtain high and stable production of gas wells in the areas which satisfy the following conditions, e.g. effectively matched source rock fault and channel sand body, a distance of 5-25 km from the fault, high ancient and modern structures or high ancient structures and low modern structures, and good reservoir physical properties. Fourth, the adoption of three-dimensional well group deployment technology, well typeselection technology and optimal horizontal well design technology greatly improves the reserve producing degree of tight sandstone gas reservoirs in narrow channels while saving the investment.Fifth,by virtue of the optimized fast drilling technology of horizontal well, the average drilling cycle of this gas reservoir is shortened from 101 d to 54 d. Based on the application of the staged fracturing technology of geology-engineering integration, the single-well gas production rate rises steadily. The single-well average gas production in 2013-2019 is 10.8 times higher than that before 2012, which indicates a remarkable stimulation effect. In conclusion, this series of technologies for the efficient development of tight sandstone gas reservoirs in narrow channels provide powerful support for the construction of the second largest continental gas field of western Sichuan Basin in the Zhongjiang Gas Field.
Number of references: 16
Main heading: Gas industry
Controlled terms: Gases - Horizontal wells - Infill drilling - Lithology - Natural gas well production - Petroleum reservoirs - Proven reserves - Sand - Sandstone - Structural geology - Tight gas - Well stimulation
Uncontrolled terms: Distribution characteristics - Drilling technology - Quantitative prediction - Reservoir physical property - Reservoir thickness - Shaximiao Formation - Strong heterogeneities - Western Sichuan basin
Classification code: 481.1 Geology - 482.2 Minerals - 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels
Numerical data indexing: Percentage 1.00e+01%, Percentage 1.00e+02%, Size 5.00e+00m to 8.00e+00m, Size 5.00e+03m to 2.50e+04m
DOI: 10.3787/j.issn.1000-0976.2020.05.007
Compendex references: YES

Database: Compendex

Data Provider: Engineering Village

47. Experiment of relieving coal dust blockage damage in coal reservoirs by oxidation treatment

Accession number: 20205209695488
Title of translation:
Authors: Kang, Yili (1); Sun, Linna (1); Fang, Dazhi (2); You, Lijun (1); Li, Xiangchen (1); Liu, Jiang (1); Lu, Yu (1)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; 610500, China; (2) Sinopec Chongqing Shale Gas Co., Ltd., Chongqing; 408400, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 11
Issue date: November 25, 2020
Publication year: 2020
Pages: 68-75
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to optimize the fracturing production effect of coalbed methane wells, this paper performs NaClO solution immersion experiment on pulverized coal samples and NaClO solution displacement experiment on cylindrical fracture-containing coal samples by taking the coal samples taken from No.16 coal seam of Upper Permian Longtan Formation in the Zhina Block of Guizhou as the research objects. Then, the effect of NaClO on removing pulverized coal blockage in natural fractures of coal rocks was evaluated by means of laser particle size analysis, infrared spectroscopy and Zeta potential test, and the reaction mechanism of pulverized coal in oxidation solution is analyzed. Finally, oxidation, blockage removal and permeability increase mechanism in coal rocks are revealed. And the following research results were obtained. First, NaClO solution has an obvious dissolution effect on organic and inorganic components of coal rock. The greater the concentration of NaClO, the highter the dissolution rate of pulverized coal and the better the effect of "net material removal". Second, NaClO solutions with a concentration of 0.1% and 1.0% respectively can effectively relieve the aggregation of pulverized coal in fracturing fluid, so that it can be discharged easily in the process of production after fracturing. Third, after pulverized coal is oxidized in NaClO solution, its particle size is degraded and the swelling damage of coal rock block and pulverized coal caused by immersion of fracturing fluid will be effectively alleviated. The larger the particle size of pulverized coal, the higher the degradation rate of particle size. And NaCl oxidation solution with a concentration of 1.0% is the best in the degradation effect on the particle size of pulverized coal. Fourth, after a fracture containing sample is oxidized in the NaClO oxidation solution with a concentration of 1.0%, its permeability can be increased by 4.22 times, indicating remarkable permeability increase effect. In conclusion, oxidation solution can dissolve the compositions of pulverized coal and coal on fracture surface, change the physical and chemical properties of pulverized coal and fracture surface, relieve the aggregation of pulverized coal particles, and promote the particle size degradation of expanded pulverized coal, so as to accelerate the discharge of pulverized coal which has formed blockage. In addition, oxidation treatment is expected to be a new technology for blockage removing stimulation of coal reservoirs.
Number of references: 35
Main heading: Pulverized fuel
Controlled terms: Agglomeration - Coal - Coal deposits - Coal dust - Coal industry - Degradation - Dissolution - Fracturing fluids - Hydraulic fracturing - Infrared spectroscopy - Methane - Natural gas wells - Oxidation - Particle size - Particle size analysis - Rocks - Sodium chloride
Uncontrolled terms: Coal bed methane wells - Displacement experiments - Inorganic components - Laser particle size analysis - Oxidation treatments - Permeability increase - Physical and chemical properties - Pulverized coal particle
Classification code: 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 524 Solid Fuels - 802.2 Chemical Reactions - 802.3 Chemical Operations - 804.1 Organic Compounds - 951 Materials Science
Numerical data indexing: Percentage 1.00e+00%, Percentage 1.00e-01%
DOI: 10.3787/j.issn.1000-0976.2020.11.008

Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

48. Quantitative description of residual gas distribution in strong-heterogeneity tight sandstone gas reservoirs and potential tapping strategies : A case study of the old area of northern Su 11 Block in the Sulige Gas Field

Accession number: 20205209694209
Title of translation: -11
Authors: Zhu, Jinli (1)
Author affiliation: (1) CNPC Great Wall Drilling Company, Panjin; 124010, China
Corresponding author: Zhu, Jinli(zhujinli6@163.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: November 25, 2020
Publication year: 2020
Pages: 89-95
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: After more than ten years of development in the old area of northern Su 11 Block in the Sulige Gas Field, some problems get more and more prominent, such as the increase of low-yield and low-pressure gas wells, uneven production of reserves, and complex distribution of remaining gas. In order to improve its development effect, it is required to accurately describe the distribution of remaining gas between wells and between layers by means of the fine characterization technology for complex fluvial sandstone reservoirs and the geological modeling-numerical simulation integrated remaining gas evaluation technology, after investigating the development experience of similar gas reservoirs. Then, after the technical boundaries of layers and well selections in sidetracking horizontal wells, sidetracking wells and layer-adjusting wells are defined, specific potential tapping strategies are formulated to guide the on-site potential tapping operation in this block. And the following research results were obtained. First, the fine characterization technology for complex fluvial sandstone reservoirs can realize the fine characterization in the level of single sandbody, quantitatively describe dominant reservoirs and provide model guidance for geological research of fluvial reservoirs. Second, the remaining gas reserve evaluation technology based on the dynamic analysis method and numerical simulation method accurately describes the lateral and vertical distribution characteristics of the remaining gas, and points out the direction of potential tapping in the next step. Third, the distribution of the remaining gas reserves in the old area of northern Su 11 Block can be divided into three modes, including uncontrolled well pattern types, intralayer heterogeneity types and interlayer heterogeneity types. For the uncontrolled well pattern type, priority is given to a sidetracking horizontal well for potential tapping. For the intralayer heterogeneity type, priority is given to a sidetracking well. And for the interlayer heterogeneity type, priority is given to a layer-adjusting well. Fourth, the technical boundaries of wells and layer selections in a sidetracking horizontal wells, sidetracking wells and layer-adjusting wells are determined. In the old area of northern Su 11 Block, 5 sidetracking horizontal wells, 8 sidetracking wells and 79 layer-adjusting wells have been deployed in total. Fifth, up to now, the efficiency of on-site measure wells is up to 100% and the cumulative natural gas increment is 1.01×108 m3. In conclusion, the potential tapping countermeasures for the old areas of tight sandstone gas reservoirs proposed on the basis of the research results achieve remarkable results in natural gas production increase and are worth popularizing and using for reference.
Number of references: 15
Main heading: Natural gas wells
Controlled terms: Gas industry - Gases - Geology - Horizontal wells - Natural gas - Natural gas well production - Numerical methods - Numerical models - Petroleum reservoir evaluation - Petroleum reservoirs - Proven reserves - Sandstone - Tight gas
Uncontrolled terms: Development experiences - Dynamic analysis method - Low yield and low pressure gas wells - Natural-gas production - Numerical simulation method - Quantitative description - Strong heterogeneities - Vertical distributions

Classification code: 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 921 Mathematics - 921.6 Numerical Methods
Numerical data indexing: Percentage 1.00e+02%
DOI: 10.3787/j.issn.1000-0976.2020.11.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

49. Source and evolution of diagenetic fluid in the Middle Permian Maokou Formation in the southern Sichuan Basin

Accession number: 20202308799570
Title of translation:
Authors: Ren, Mengyi (1); Jiang, Qingchun (1); Wang, Zecheng (1); Huang, Shipeng (1); Wu, Ya (2); Xu, Liang (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) Shunan Division, PetroChina Southwest Oil & Gasfield Company, Luzhou; Sichuan; 646001, China
Corresponding author: Jiang, Qingchun(jiangqc@petrochina.com.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: April 25, 2020
Publication year: 2020
Pages: 40-50
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Carbonate rocks in the Middle Permian Maokou Formation in the southern Sichuan Basin have experienced complex pore-fluid activities. So far, however, the coupling relationship between multi-stage diagenetic fluids and hydrocarbon fluids has been less researched from the perspective of microscopic geochemistry. For this reason, this paper firstly carried out core observation and thin section analysis on the Maokou Foramtion of this area. Then, petrology, rare earth elements, carbon and oxygen isotopes and fluid inclusions were analyzed. Finally, diagenetic environment, fluid source and fluid evolution of Maokou Formation in different diagenetic stages were studied in the regional structure evolution setting. And the following research results were obtained. First, the Maokou Formation in this area experiences the diagenetic evolution process of "(pene)contemporaneous-eogenetic calcite cementation in the mixed water#epigenetic dissolution in the atmospheric freshwater#phyllomorphic calcite and dolomite cementation, metasomatism and acidic-fluid dissolution in the formation water". Second, the fluid sources in the process of sedimentation and diagenetism include seawater, atmospheric freshwater, hydrocarbon fluids and deep (thermal) fluids. Among them, the oxidized seawater is characterized by left-lead limestone REE, similar #13C features to those of the global paleo-seawater, Eu positive anomaly of acidic hydrothermal fluid and obvious negative #13C. And the evidence for the participation of the atmospheric freshwater is that the #18O of the carbonate cements in fractures and dissolved pores is obviously negative. Third, the Maokou Formation experiences multi-phase hydrocarbon charging. During the Late Permian-Early Triassic, the Maokou Formation was uplifted and exposed to leaching, and the anomalous thermal of the Emei mantle plume led to formation dolomitization and hydrocarbon charging. Dissolution of atmospheric freshwater and organic acid, dolomitization and fracturing in this period play a constructive role for the Maokou Formation reservoir. Pressure dissolution and coarse-grained calcite cementation since the Jurassic play a role in destructing the Maokou Formation reservoir. And karst reservoirs associated with structural fractures are more conducive to later gas accumulation. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 39
Main heading: Dissolution
Controlled terms: Calcite - Cementing (shafts) - Exploratory geochemistry - Fracture - Hydrocarbons - Lime - Mineralogy - Rare earths - Seawater
Uncontrolled terms: Atmospheric freshwater - Carbon and oxygen isotopes - Coupling relationships - Diagenetic evolution - Hydrocarbon fluids - Hydrothermal fluids - Pressure dissolution - Structural fracture
Classification code: 471.4 Seawater, Tides and Waves - 481.2 Geochemistry - 482 Mineralogy - 802.3 Chemical Operations - 804.1 Organic Compounds - 804.2 Inorganic Compounds - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.04.005

Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

50. Problems in the application of element logging and solutions

Accession number: 20202308799535
Title of translation:
Authors: Tang, Xie (1); Yin, Ping (1); Tang, Jiaqiong (1); Yang, Lin (1); Wu, Jiajie (1)
Author affiliation: (1) Geological Exploration & Development Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China
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Publication year: 2020
Pages: 51-58
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, element logging has been widely used in the field of oil and gas exploration, and it not only effectively solves the bottleneck problems of mud logging under the conditions of PDC bit and gas drilling, but also provides the powerful support for drilling engineering in terms of sublayer division, evaluation while drilling and geosteering to ensure its rapid, safe and efficient implementation. In the practical application of element logging, however, there are still some problems, which restrict its popularization and application. For this reason, this paper firstly analyzed the causes of the problems in the application of element logging. Then, the stability characteristics of each element were clarified by means of repetitive experiments and classified treatment was carried out. Finally, combined with data comparison and analysis results, the countermeasures and methods to solve the problems were put forward. And the following research results were obtained. First, there are some problems in the practical application of element logging, such as the instability of measurement data and the poor lateral comparability of numerical values. Second, the main causes of the problems in the application of element logging are the limitation of equipment manufacturing process and the restriction of field analysis conditions, which directly impact the stability, accuracy and reliability of data. Third, the repetitive experimental results show that the stability of major elements is generally good and the stability of trace elements is generally poor, so the classified treatment can guarantee the effective application of element logging. It is concluded that the selection of Si, Ca, Fe and Al as analysis treatment elements and the establishment of standardized treatment method can effectively guarantee the data accuracy of important elements. And the research results are conducive to the further popularization and application of element logging technology. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 18
Main heading: Logging while drilling
Controlled terms: Clarification - Infill drilling - Mud logging - Oil well logging - Petroleum prospecting - Reliability analysis - Stability - Trace elements
Uncontrolled terms: Bottleneck problem - Drilling engineering - Efficient implementation - Equipment manufacturing - Evaluation while drillings - Measurement data - Oil and gas exploration - Treatment methods
Classification code: 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 802.3 Chemical Operations
DOI: 10.3787/j.issn.1000-0976.2020.04.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

51. A gas-bearing property identification method for deep reservoirs based on frequency-dependent AVO inversion

Accession number: 20200908220904
Title of translation: AVO

Authors: Liu, Daoli (1); Li, Kun (2); Yang, Dengfeng (1); Wei, Xuwang (1)
Author affiliation: (1) Research Institute, CNOOC China Limited Shenzhen Branch, Shenzhen; Guangdong; 510240, China; (2) School of Geosciences, China University of Petroleum , Qingdao; Shandong; 266580, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 48-54
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: During the propagation of seismic wave in underground hydrocarbon bearing reservoirs, the phenomena of seismic amplitude attenuation and elastic characteristic dispersion happen, which makes it difficult to identify the fluids in deep hydrocarbon bearing reservoirs based on seismic data. In this paper, the fluid sensitivity degrees of a variety of frequency-dependent elastic parameters were analyzed based on the Chapman theoretical model of fractured-porous microstructure attenuation. And accordingly, the dispersion degree of Gassmann fluid term was selected as an identification factor for the gas-bearing prediction of deep reservoirs. Then, combined with the frequency spectrum decomposition method which is used for continuous wavelet conversion, spectrum analysis was carried out on some seismic data stacked with angle to determine the reference frequency. Based on this, the inversion optimization method of prestack seismic frequency-dependent Gassmann fluid term based on the Bayes Cauchy constraint criterion was researched, and the inversion result of frequency-dependent Gassmann fluid term was used to guide reservoir fluid detection. Finally, this method was applied in P exploration area in one offshore basin of China to verify its role in gas-bearing prediction of deep reservoirs. And it is indicated that by virtue of this method, the frequency-dependent Gassmann fluid parameters based on prestack seismic data can be extracted reliably, and correspondingly the identification results of deep reservoir fluid are better consistent with the actual logging interpretation results. In conclusion, the frequency-dependent Gassmann fluid term is conducive to identifying deep reservoirs effectively and provides a new idea and method for the identification of deep gas layers.
Number of references: 19
Main heading: Oil bearing formations
Controlled terms: Dispersion (waves) - Forecasting - Gas bearings - Gases - Hydrocarbons - Offshore oil well production - Petroleum reservoirs - Seismic prospecting - Seismic response - Seismic waves - Spectrum analysis - Wavelet decomposition
Uncontrolled terms: Deep reservoirs - Fluid factors - Fluid identification - Frequency dependent - Gassmann fluid term - Spectral decomposition
Classification code: 484 Seismology - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 601.2 Machine Components - 804.1 Organic Compounds - 921.3 Mathematical Transformations
DOI: 10.3787/j.issn.1000-0976.2020.01.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

52. Reservoir space and potential reservoir-formation areas in deep bedrock gas reservoirs in Altun forelands, Qaidam Basin: Recognition and discussion

Accession number: 20201208317057
Title of translation:
Authors: Li, Jiangtao (1); Fu, Suotang (2); Wang, Renyi (3); Liu, Yingru (4); Wang, Haicheng (1); Ao, Wenbo (2); Ma, Teng (1)
Author affiliation: (1) PetroChina Qinghai Oilfield Company, Dunhuang; Gansu; 736202, China; (2) PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (3) Zhejiang Ocean University, Zhoushan; Zhejiang; 316022, China; (4) Research Institute of Petroleum Exploration & Development - Northwest, PetroChina, Lanzhou; Gansu; 730020, China
Source title: Natural Gas Industry
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The discovery of deep bedrock gas reservoirs in Altun forelands in the Qaidam Basin has expanded a new field of natural gas exploration and development in China. Since then, it has always been believed that the storage space of this kind of gas reservoirs is composed of well-developed dual media of matrix pores and fractures, but the practices of such gas reservoir development began to be in contradiction with this cognition. In order to achieve a better understanding of the storage space and the main controlling factors of reservoir formation in this bedrock gas reservoir, it is necessary to investigate the dissolved increased pores characteristics and the forced fractures characteristics in the bedrock gas reservoir. Then, based on the data such as cores and cast thin sections in the bedrock intervals in the Dongping 1 and Jiantan 1 blocks, the main storage space types of deep bedrock gas reservoirs in Altun forelands were analyzed, then the main controlling factors of favorable target reservoirs in these blocks were put forward, and in combination with the regional geological background, the geological understandings of favorable target reservoirs and potential reserves were deepened in this study area. The following research results were achieved. (1) The lithology of the bedrock gas reservoirs in this area consists of calc-alkaline igneous rocks and gneiss suite regional metamorphic rocks. Matrix pores are not developed, and their development degree is mainly controlled by faults. Main effective storage spaces and permeable channels are structural fractures and dissolution fractures. (2) The main controlling factors of target reservoir formation include lithology, tectonic effect, weathering, intrusive dikes, and on the whole the rule of ternary-control is followed, namely prevalent lithology-dominant stresses-hydrocarbon accumulations in the structural higher parts. (3) The potential zones of reservoir formation include the following 5 types: tectonically stress concentrated tension-torsional zones, contact zones between lithologic interfaces of intrusive body, weathering zones of compressing uplift, slope sediment zones near circumscribed erosion area, para-conformity or unconformity interface.
Number of references: 16
Main heading: Petroleum reservoirs
Controlled terms: Digital storage - Fracture - Gases - Igneous rocks - Lithology - Metamorphic rocks - Natural gas fields - Proven reserves - Structural geology - Weathering
Uncontrolled terms: Altun forelands - Gas reservoir - Main controlling factors - Potential area - Qaidam basin
Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 722.1 Data Storage, Equipment and Techniques - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.02.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

53. In-situ stress profile prediction based on the rheological model: A case study of Well AY-1 in the Qianbei area of Guizhou Province

Accession number: 20201708556760
Title of translation: --1
Authors: Sun, Dongsheng (1, 2); Pang, Fei (3); Li, Awei (1, 2); Wang, Yufang (4); Yang, Yuehui (1, 2); Chen, Qunce (1, 2)
Author affiliation: (1) Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing; 100081, China; (2) Key Laboratory of Active Tectonics and Crustal Stability Assessment, Beijing; 100081, China; (3) China Geological Survey, Beijing; 100029, China; (4) Oil & Gas Survey, China Geological Survey, Beijing; 100029, China
Source title: Natural Gas Industry
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In-situ stress is a key parameter in the sweet-spot assessment, horizontal well arrangement and fracturing design in the exploration and development of unconventional oil and gas reservoirs. At present, the elastic model based on in-situ stress evaluation technology which is used for conventional reservoirs is applied to shale reservoirs at home and abroad while the effects of rheological behaviors on the distribution laws of in-situ stress in shale reservoirs are not taken into consideration, which brings a larger error to the evaluation result of in-situ stress of shale reservoirs. In this paper, a new in-situ stress evaluation method base on the rheological model was put forward to increase the evaluation and calculation accuracy of in-situ stress parameters. Then, the variation laws of rock rheological parameters with the depth were determined by using the rock mechanical parameters obtained from cross-dipole acoustic logging data, referring to the related experimental results. And combined with the burial history of the basin and the strain rate of the crust, the in-situ stress profile of Well AY-1 in the Qianbei area of Guizhou Province was established. Finally, the in-situ stress evaluated by the new method was compared with the one measured in the mini frac and the one determined by the stress polygon method. And it is indicated that the in-situ stress profile of Well AY-1 predicted by the new method is consistent with the test result and its in-situ evaluation result presents a good corresponding relationship with the result of Gamma logging. As the content of clay mineral or organic matter increases, the horizontal principal stress difference decreases, indicating that the in-situ stress evaluation result by the new method is in better accordance with the distribution law of true in-situ stress.
Number of references: 20
Main heading: Petroleum reservoir evaluation
Controlled terms: Acoustic logging - Horizontal wells - Oil field development - Oil well logging - Petroleum prospecting - Petroleum reservoirs - Shale - Strain rate - Stress analysis
Uncontrolled terms: Calculation accuracy - Exploration and development - In-situ stress profiles - Rheological behaviors - Rheological modeling - Rheological parameter - Rock mechanical parameters - Unconventional oil and gas
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 751.2 Acoustic Properties of Materials - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.03.007
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

54. A new coal reservoir permeability model considering the influence of pulverized coal blockage and its application

Accession number: 20202908937735
Title of translation:
Authors: Shi, Juntai (1, 2); Wu, Jiayi (1, 2); Fang, Yexin (1, 2); Lu, Jiaguo (1, 2); Hou, Chenhong (3); Li, Xiangfang (1, 2); Zhang, Sui'an (1, 2); Xiong, Xianyue (4)
Author affiliation: (1) Coalbed Methane Research Center, China University of Petroleum, Beijing; 102249, China; (2) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing; 102249, China; (3) CNOOC Gas & Power Group, Beijing; 100028, China; (4) PetroChina Coalbed Methane Co., Ltd., Beijing; 100028, China
Source title: Natural Gas Industry
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Publication year: 2020
Pages: 78-89
Language: Chinese
ISSN: 10000976
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency

Abstract: In order to accurately predict the production performance of coalbed methane (CBM) wells and to formulate a reasonable production system, this paper established a coal reservoir permeability model considering the influence of pulverized coal blockage. Then, on the basis of this model, the flow velocity sensitivity (FVS) experimental data of 15 groups of coal samples taken from the Baode Block, Qinshui Basin, Liulin Block, Hancheng Block and the Huanglong Coalfield were fitted to determine the permeability models for different coal samples. On this basis, this newly established permeability model was incorporated into a previously developed CBM well performance analysis software, and production history matching was carried out on two CBM wells. Finally, the effects of the parameters of pulverized coal blockage on the permeability of coal reservoirs and the production performance of CBM wells were studied by taking the fitting parameters of CBM Well W1 as the reference. And the following research results are obtained. First, this new model considering the influence of pulverized coal blockage can quantitatively describe the variation of coal reservoir permeability with fluid velocity. In addition, this model can be incorporated into a CBM numerical simulation software or a CBM well performance analysis software to apply it in a wide range. Second, the coal reservoir permeability is less affected by pulverized coal blockage in the Baode Block, but this effect shall not be ignored in the Qinshui Basin and the Huanglong Coalfield. Third, the greater the theoretical maximum permeability damage degree (Dmax) and the permeability damage degree index (n) are, the lower the relative flow velocity (v0.5) corresponding to the critical flow velocity of pulverized coal blockage is and the more obvious the effect of pulverized coal blockage on coal reservoir permeability. Fourth, in order to reduce the adverse effect of pulverized coal blockage on coal reservoir permeability, it is suggested to reduce the production pressure difference appropriately in the process of production, especially in the initial stage of gas production, so as to avoid severe damage to coal reservoir permeability.
Number of references: 47
Main heading: Pulverized fuel
Controlled terms: Coal - Coal deposits - Coal industry - Computer software - Flow velocity - Gas industry - Mechanical permeability - Methane - Natural gas wells - Petroleum reservoir engineering - Velocity
Uncontrolled terms: Critical flow velocity - Fitting parameters - Numerical simulation software - Permeability damage - Permeability model - Production performance - Production pressure differences - Velocity sensitivity
Classification code: 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 524 Solid Fuels - 631 Fluid Flow - 723 Computer Software, Data Handling and Applications - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.06.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

55. Breakthrough and application of key technologies for the seismic exploration of marine oil and gas in the South Yellow Sea

Accession number: 20210309770841
Title of translation:
Authors: Wu, Zhiqiang (1, 2); Qi, Jianghao (1, 2); Wen, Zhenhe (1, 2); Zhang, Xunhua (1, 2); Xing, Lei (2, 3); Yin, Yanxin (2, 3); Luo, Di (1, 2); Xiao, Guolin (1, 2)
Author affiliation: (1) Qingdao Institute of Marine Geology, China Geological Survey, Qingdao; 266071, China; (2) Laboratory for Marine Mineral Resources, Pilot National Laboratory for Marine Science and Technology, Qingdao; 266237, China; (3) Ocean University of China, Qingdao; 266100, China
Corresponding author: Qi, Jianghao(jhaoqi@126.comemailwenzhh@sina.com)Wen, Zhenhe(wenzhh@sina.com)
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Publication year: 2020
Pages: 29-40
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the South Yellow Sea Basin develop thick and extensive Mesozoic-Paleozoic marine strata, which are the important targets of oil and gas exploration and development. Due to complex geological conditions and harsh seismic

acquisition environment, however, seismic imaging quality is poor, which restricts the oil and gas exploration process in this area. In order to solve these technological difficulties, this paper developed three key technological series of seismic data acquisition, processing and interpretation for the Mesozoic-Paleozoic marine strata in the South Yellow Sea Basin by carrying out a series of researches. And the following research results were obtained. First, effective reflection and imaging of the marine lower structural layer in the central uplift and the northern depression of the South Yellow Sea Basin is realized by means of stereoscopic seismic data acquisition, wide-angle reflection seismic signal extraction, wide-angle reflection wave imaging processing and comprehensive seismic interpretation and their offshore test and application, so as to meet the requirements of geological study and seismic imaging. Second, a series of new important understandings are obtained on the distribution and structural characteristics of the marine lower structural layer in the South Yellow Sea, which points out the direction in the potential evaluation and exploration of marine oil and gas resources in the South Yellow Sea Basin. Third, on this basis, CSDP-2 scientific drilling well location is proposed, which is verified to be reliable by the thicker source rocks drilled in the Mesozoic-Paleozoic marine strata and the oil and gas shows in multiple reservoirs. In conclusion, these key seismic exploration technologies provide technological support for the oil and gas exploration in the marine strata of the South Yellow Sea Basin and their application prospect is promising. The research results strengthen the confidence of the marine oil and gas exploration in the South Yellow Sea.
Number of references: 45
Main heading: Offshore petroleum prospecting
Controlled terms: Data acquisition - Data handling - Energy resources - Gases - Geological surveys - Geology - Infill drilling - Offshore gas fields - Offshore oil well production - Offshore oil wells - Oil well drilling - Oil well testing - Seismic prospecting - Seismic response - Seismic waves - Stereo image processing
Uncontrolled terms: Complex geological condition - Oil and gas exploration - Seismic data acquisitions - Seismic interpretation - South Yellow Sea Basin - Structural characteristics - Technological supports - Wide-angle reflection
Classification code: 481.1 Geology - 481.4 Geophysical Prospecting - 484 Seismology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 525.1 Energy Resources and Renewable Energy Issues - 723.2 Data Processing and Image Processing
DOI: 10.3787/j.issn.1000-0976.2020.12.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

56. Innovation and practice of the key technologies for the efficient development of the Supergiant Anyue Gas Field

Accession number: 20200908220908
Title of translation:
Authors: Xie, Jun (1)
Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China
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Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 1
Issue date: January 25, 2020
Publication year: 2020
Pages: 1-10
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, the Sichuan Basin has been the most potential hydrocarbon-bearing basin in China thanks to the great exploration and development breakthroughs of deep large integral carbonate gas reservoirs and shale gas in this basin. The Anyue Gas Field located in central Sichuan Basin is not only the largest carbonate gas reservoir, but the most important supergiant gas field discovered in China in recent years. However, it faces a series of major difficulties, e.g. low reservoir porosity, low permeability, low gas well productivity, thin and vertically and laterally disperse gas layer, strong heterogeneity, quite low structural amplitude and complicated gas-water relationship, which bring great challenges to the rapid conversion of natural gas reserves to production. In this regard, technical

researches have been carried out continuously. As a result, many key technologies have been innovatively integrated and great breakthroughs have been realized in many aspects. First, fine development technologies for supergiant, ancient and complex carbonate gas reservoirs are developed innovatively, "transparent gas reservoir" is constructed and the technologies for cultivating high-yield wells are established. By virtue of these technologies, all development wells in the gas reservoir of Lower Cambrian Longwangmiao Formation reach the target of high yield and the single-well gas production rate of the gas reservoir of Lower Sinian Dengying Formation is increased significantly, which provides support for the long-term high production and stable production of Anyue Gas Field. Second, good and fast construction technologies for large-scale gas fields are innovatively integrated. Based on this, the safety of gas wells is under control in the whole life cycle, quality engineering is built up efficiently within 3 years, green mining areas are forged and large-scale safe and clean gas fields are built up efficiently. Third, intelligent control technologies for the development of supergiant gas fields are innovatively integrated. By means of these technologies, internet of everything, depth perception and automatic production are realized. The intelligent technologies of new generation are fused, including AR, VR, robot and unmanned aerial vehicle (UAV). A new intelligent management mode for gas field development is set up, and an intelligent gas field is built up. Fourth, optimization technologies for the overall development of supergiant gas fields are innovatively developed, so as to improve the development effects of strong-heterogeneity gas reservoirs and ensure the long-term stable production of supergiant water-bearing gas reservoirs. The research results can be used as reference for the efficient development of similar domestic and foreign gas fields.

Number of references: 27
Main heading: Reservoir management
Controlled terms: Antennas - Bearings (machine parts) - Carbonation - Depth perception - Gas industry - Gas permeability - Gases - Intelligent robots - Life cycle - Low permeability reservoirs - Natural gas - Natural gas well production - Natural gas wells - Natural gasoline plants - Oil bearing formations - Petroleum reservoir engineering - Proven reserves - Quality control - Unmanned aerial vehicles (UAV)
Uncontrolled terms: Central Sichuan Basin - Efficient development - Gas fields - Gas reservoir - Intelligent management - Strong heterogeneities
Classification code: 512 Petroleum and Related Deposits - 513.2 Petroleum Refineries - 522 Gas Fuels - 601.2 Machine Components - 652.1 Aircraft, General - 731.6 Robot Applications - 802.2 Chemical Reactions - 913.3 Quality Assurance and Control - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Age 3.00e+00yr
DOI: 10.3787/j.issn.1000-0976.2020.01.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

57. Progress and prospect of key experimental technologies for shale gas geological evaluation

Accession number: 20202908937815
Title of translation:
Authors: Wang, Hongyan (1, 2, 3); Zhou, Shangwen (1, 2, 3); Liu, Dexun (1, 2, 3); Jiao, Pengfei (1, 2, 3); Liu, Honglin (1, 2, 3)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) National Energy Shale Gas R & D Center, Langfang; Hebei; 065007, China; (3) CNPC Key Laboratory of Unconventional Oil & Gas, Langfang; Hebei; 065007, China
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Publication year: 2020
Pages: 1-17
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The development of shale gas geological evaluation experimental technology is of great significance for shale gas "sweet spot"evaluation, geological selection, and reserves calculation. In recent years, with the development

of shale gas exploration and development in China, such technology has made great progress especially in the three aspects of shale micro-pore structure, gas bearing property and petrophysical property. Through the combination of advanced technology introduction and independent development of equipments, the analysis and test technology and standards applicable to marine shale in China have already been established, which plays an important role in promoting the exploration and development of shale gas in China. In this regard, we systematically summarized the progress of the above three key technologies at home and abroad, and looks forward to development trends in the future. As for shale micro-pore structure tests, a variety of qualitative observation and quantitative characterization test methods have been formed, realizing the transformation from static to dynamic characterization, while further research needs to be done in the aspects of in-situ characterization of shale pore structure and direct observation of fluid occurrence characteristics in pores. As for shale gas bearing tests, a series of on-site and indoor gas bearing characterization technologies have been established to realize the quantitative evaluation of adsorbed and free gas occurrence characteristics in shale, while further research is needed in lost gas calculation for deep shale, shale gas adsorption mechanism and models. As for shale petrophysical property tests, the porosity and permeability test technology combined with various methods has been established to realize the quantitative evaluation of shale porosity effectiveness, but it is still necessary to carry out comparative research and unify the standards in terms of porosity test conditions and methods so as to meet the requirements of both research and production.
Number of references: 135
Main heading: Oil bearing formations
Controlled terms: Gas adsorption - Gas bearings - Gases - Geological surveys - Petrophysics - Pore structure - Porosity - Proven reserves - Shale gas - Testing
Uncontrolled terms: Dynamic characterization - Exploration and development - In-situ characterization - Micro-pore structures - Petrophysical properties - Qualitative observations - Quantitative characterization - Quantitative evaluation
Classification code: 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 601.2 Machine Components - 802.3 Chemical Operations - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.06.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

58. A shale gas resource evaluation method based on retention coefficient

Accession number: 20210109725889
Title of translation:
Authors: Song, Zhenxiang (1); Qiu, Qi (1); Zhao, Linjie (1); Wang, Baohua (1); Ma, Zhongliang (1); Yang, Guoqiao (1)
Author affiliation: (1) Wuxi Branch, Sinopec Exploration & Production Research Institute, Wuxi; 214151, China
Corresponding author: Qiu, Qi(qiuqi.syky@sinopec.com)
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Abbreviated source title: Natur. Gas Ind.
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Issue date: October 25, 2020
Publication year: 2020
Pages: 12-19
Language: Chinese
ISSN: 10000976
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to evaluate shale gas resources scientifically and reasonably, this paper systematically analyzed the shale gas resource evaluation methods that are commonly used at home and abroad and their main problems. Then, based on the evolution process of hydrocarbon generation, expulsion and retention of mud shale, the concept and calculation method of the retention coefficient of shale gas were proposed. Finally, the factors influencing the retention coefficient of shale gas was analyzed based on typical wells, and a shale gas resource calculation method based on retention coefficient and basin modeling was newly established. And the following research results were obtained. First, shale gas resource evaluation methods can be classified into three types, including static method, dynamic method and integrated method. However, the static methods commonly used at home are volume method and analogy method, which fail to determine the spatial distribution of shale gas resources. And this problem can be solved by

virtue of the technical idea of applying the genetic method to calculate shale gas resources. Second, the concept of the retention coefficient of shale gas is put forward based on the evolution process of hydrocarbon generation-expulsion-retention of mud shale. The retention coefficient of shale gas is the most critical parameter when the genetic method is used to calculate shale gas resources. And it can be back calculated from the measured gas content, based on the fine simulation calculation of hydrocarbon generation-expulsion-retention of mud shale in a single well. Third, the retention coefficient of shale gas in different areas is mainly affected by hydrocarbon generation conditions, reservoir properties and preservation conditions of mud shale. In conclusion, the shale gas resource evaluation method based on retention coefficient has a promising application prospect and can provide an important basis for the selection and evaluation of shale gas area, the selection of favorable area and the formulation of exploration deployment.
Number of references: 26
Main heading: Petroleum prospecting
Controlled terms: Energy resources - Gases - Hydrocarbons - Petroleum deposits - Shale gas
Uncontrolled terms: Application prospect - Hydrocarbon generation - Integrated method - Preservation condition - Reservoir property - Retention coefficients - Selection and evaluations - Simulation calculation
Classification code: 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.10.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

59. Optimization design method for the bypass trajectories of infill adjustment wells in the fracturing areas of shale gas fields

Accession number: 20205009619790
Title of translation:
Authors: Gu, Yue (1); Gao, Deli (1); Yang, Jin (1); Diao, Binbin (1); Hu, Degao (2); Nie, Shuaishuai (3)
Author affiliation: (1) MOE Key Laboratory of Petroleum Engineering, China University of Petroleum, Beijing; 102249, China; (2) Sinopec Chongqing Fuling Shale Gas Exploration and Development Co., Ltd., Chongqing; 408000, China; (3) Chengde Petroleum College, Chengde; 067000, China
Corresponding author: Gao, Deli(gaodeli@cast.org.cn)
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Publication year: 2020
Pages: 87-96
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the design of a shale-gas cluster horizontal well, it is necessary to consider the bypass of the fracturing influence domains of existing wells and the interference between fracturing influence domains when the wellbore trajectories of infill adjustment wells in the fracturing areas are designed. In order to quickly evaluate the rationality of the design scheme of fracturing wellbore trajectory in an infill adjustment well, this paper adopted the vector algebra method to build a geometric model of the obstacles in the shale gas fracturing area. In this geometric model, the influence domains of hydraulic fractures are taken into account. Then, based on this geometric model, the optimization design model of bypass trajectory in the shale gas fracturing area was established by taking the minimization of total trajectory length and trajectory potential energy as the optimization objective and the anti-collision between trajectories as the constraint. Besides, the geometric check method to judge if there is any interference between fracturing influence domains was provided. Finally, the established optimization design model was verified based on the actual drilling data of Fuling Shale Gas Field in the Sichuan Basin. And the following research results were obtained. First, the obstacle sizes in fracturing areas will be seriously underestimated if the fracturing influence domains are neglected. Second, if the fracturing influence domains are neglected, the designed bypass trajectory can bypass the wellbore trajectories of old wells, but may intersect the fracturing influence domains of existing wells, thus inducing drilling accidents. In conclusion, the proposed optimization design model of bypass trajectory in the shale gas fracturing

area can satisfy the constraint of anti-collision and bypass and achieve the optimization objective of minimizing total trajectory length and trajectory potential energy, and the corresponding design calculation avoids complex calculation and check.
Number of references: 33
Main heading: Infill drilling
Controlled terms: Boreholes - Collision avoidance - Fracturing (fossil fuel deposits) - Gases - Geometry - Horizontal wells - Molecular physics - Oil field equipment - Potential energy - Shale gas - Trajectories
Uncontrolled terms: Adjustment well - Design calculations - Geometric modeling - Influence domains - Optimization design - Research results - Trajectory length - Wellbore trajectory
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 522 Gas Fuels - 914.1 Accidents and Accident Prevention - 921 Mathematics - 931.3 Atomic and Molecular Physics
DOI: 10.3787/j.issn.1000-0976.2020.09.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

60. Geochemical characteristics of abiogenic gas in the quartz veins in the basement rocks of the Songliao Basin and their indicative significance

Accession number: 20210109725848
Title of translation:
Authors: Meng, Fanchao (1); Cui, Yan (2); Zhang, Yuejing (3); Wang, Lin (3); Du, Qing (1); Liu, Haoyi (1); Zuo, Gengchao (1); Tian, Yulu (1)
Author affiliation: (1) School of Geosciences, China University of Petroleum-East China, Qingdao; 266580, China; (2) College of Geoscience and Engineering, Shandong University of Science and Technology, Qingdao; 266590, China; (3) Exploration and Development Research Institute, Sinopec Shengli Oilfield Company, Dongying; 257015, China
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: There is abiogenic gas derived from the interior of the Earth in the deep strata of the Songliao Basin, but few direct geological evidences have been found. This problem would be solved by analyzing the basement rocks in this basin. In this paper, the petrographic and carbon, hydrogen and oxygen isotopic characteristics of quartz veins in the basement rocks and their fluid inclusions were studied by means of basement core sample collection, quartz vein separation, inclusion petrography and fluid geochemistry. Then, the origins of the quartz veins and the fluids in their inclusions were discussed, and fluid records of gas migration from deep to shallow areas were explored. In addition, the indicative significance of the fluids in the inclusions of quartz veins in the basement was analyzed. And the following research results were obtained. First, the oxygen isotope value of quartz veins is in the range of 8.1-9.5‰, and they are the products of post-magmatic hydrothermal crystallization. Second, there are three types of primary fluid inclusions in the quartz veins, including H2O, H2O-CO2 and H2O-CO2-CH4, and their complete homogenization temperature is between 320 and 360. CO2 and H2O are dominant components with a little CH4, C2H6, N2, O2 and Ar. Third, #18O and #D of the water in the fluid inclusions of veins are 2.0-3.8‰ and-91.6--75.7‰, respectively, which are the characteristics of residual water after magma degassing. Fourth, #13C of CO2 varies in a larger range (-13.8--9.7‰). #13C1 and #13C2 of alkane are in the range of -30.6--24.1‰ and -33.2--25.7‰, respectively, and #13C1 is greater than #13C2, indicating a reversed carbon isotopic trend. CO2 and alkane present the characteristics of abiogenic gas. In conclusion, #13C1 and #13C2 of alkane in quartz veins are accordant with the characteristics of alkane gas with completely reversed carbon isotopes in the deep strata of the basin, indicating both of them may have a certain familiarity. In addition, the hydrothermal fluid generated by magmatic activities below the basement of the Songliao Basin gets crystallized in the fissures of the basement to form quartz veins, which capture some abiogenic gas from the hydrothermal fluid. The rest abiogenic gas migrates along the discordogenic fault up to the interior of the

basin, which contributes to the formation of deep gas reservoirs.
Number of references: 40
Main heading: Quartz
Controlled terms: Buildings - Carbon - Carbon dioxide - Gases - Geochemistry - Hydrocarbons - Isotopes - Mineralogy - Oxygen - Paraffins - Petroleum reservoirs
Uncontrolled terms: Deep gas reservoirs - Fluid geochemistry - Geochemical characteristic - Homogenization temperatures - Hydrothermal crystallization - Hydrothermal fluids - Oxygen isotope values - Sample collection
Classification code: 402 Buildings and Towers - 481.2 Geochemistry - 482 Mineralogy - 482.2 Minerals - 512.1.1 Oil Fields - 804 Chemical Products Generally
DOI: 10.3787/j.issn.1000-0976.2020.10.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

61. Progress and development direction of production test and reservoir stimulation technologies for ultra-deep oil and gas reservoirs in Tarim Basin

Accession number: 20205209693544
Title of translation:
Authors: Liu, Hongtao (1); Liu, Ju (1); Liu, Huifeng (1); Qiu, Jinping (2); Cai, Bo (3); Liu, Junyan (1); Yang, Zhanwei (3); Liu, Jiangyu (1)
Author affiliation: (1) PetroChina Tarim Oilfield Company, Korla; 841000, China; (2) PetroChina Exploration and production Branch Company, Beijing; 100007, China; (3) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China
Corresponding author: Liu, Huifeng(liuhuifeng123@126.com)
Source title: Natural Gas Industry
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, PetroChina Tarim Oilfield Company has successively achieved great breakthroughs in ultra-deep oil and gas exploration in the Tarim Basin. And these achievements are closely related with the progress of ultra-deep production tests and reservoir stimulation technologies. As the number of ultra-deep wells increases, production tests and reservoir stimulation technologies shall be upgraded and improved continuously. By summarizing the development history of production tests and reservoir stimulation technologies in PetroChina Tarim Oilfield Company, this paper systematically analyzes the major progresses of production tests and reservoir stimulation technologies for ultra-deep oil and gas reservoirs. Then, the development directions of production tests and reservoir stimulation technologies for ultra-deep oil and gas reservoirs of the Tarim Basin in the near future are pointed out based on the new exploration & development situations and requirements. And the following research results were obtained. First, a series of special technologies have been developed in PetroChina Tarim Oilfield Company to support successive exploration breakthroughs and continuous efficient development of ultra-deep oil and gas reservoirs in the Tarim Basin, including safe and fast production test technology for ultra-deep HTHP gas wells, integrated production tests and well completion technology for ultra-deep fractured-vuggy carbonate gas reservoirs with high sulfur content, in-depth stimulation technology for ultra-deep fractured-vuggy carbonate reservoirs, and fracture-network stimulation technology for ultra-deep HTHP fractured tight sandstone gas reservoirs. Second, as exploration and development steps into the fields below 9 000 m, where reservoir geological conditions are more complex, well completion, production tests and reservoir stimulation technologies will face new technological challenges. Third, in the future, production tests and well completion tools and technologies will be continuously upgraded and improved based on the target of reliability, safety and efficiency. And it is necessary to continuously improve geology-engineering integrated design of reservoir stimulation, stimulation fluids and materials, and HTHP tools and equipment to support fine fracture-network volumetric stimulation. Fourth, in order to meet the requirements of well integrity in new situations, it is necessary to improve the

related supporting technologies while establishing casing wear evaluation and surface manifold remaining life test methods, so as to ensure the smooth implementation of production tests and reservoir stimulation technologies. In conclusion, the research results can provide references for the safe and efficient well construction and production increase in ultra-deep oil and gas reservoirs at home and abroad.
Number of references: 46
Main heading: Oil field development
Controlled terms: Fracture - Gas industry - Gases - Geology - Natural gas well completion - Natural gas well production - Oil well completion - Oil well production - Oil well testing - Petroleum prospecting - Petroleum reservoir evaluation - Petroleum reservoirs - Well stimulation
Uncontrolled terms: Development directions - Development situations - Exploration and development - Oil and gas exploration - Reservoir stimulations - Safety and efficiencies - Supporting technology - Technological challenges
Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 951 Materials Science
Numerical data indexing: Size 9.00e+03m
DOI: 10.3787/j.issn.1000-0976.2020.11.009
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

62. Analysis on the bias current in the manifold of measurement system at the Heihe initial station of China-Russian Eastern Gas Pipeline

Accession number: 20210109725390
Title of translation:
Authors: Lu, Meitong (1); Mao, Pingping (1); Zhao, Shihao (1); Liu, Liang (1); Jiang, Han (1)
Author affiliation: (1) China Petroleum Pipeline Engineering Corporation, Langfang; 065000, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Pages: 133-138
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: China-Russian Eastern Gas Pipeline is the transnational gas pipeline whose gas delivery rate is the highest in China, and the Heihe initial station is the first station of the China-Russian Eastern Gas Pipeline in the territory of China, which is equipped with a measurement comparison facility for transnational natural gas trade. This facility has multiple measurement branches and the flow distribution in different branches is not uniform, which may influence the reliability and accuracy of measurement results. In order to avoid the bias current in the manifold of the measurement system at the Heihe initial station, this paper adopted the finite element simulation method to analyze and simulate the flow field in the measurement system. And the following research results were obtained. First, in engineering, bias current is usually avoided by balancing the friction and resistance along each branch. And compared with this design method, the installation scheme design of the manifold of measurement system based on finite element simulation is more precise and reliable. Second, under the designed working conditions at the Heihe initial station, the installation form of "inlet and outlet on the same side" can avoid the bias current in the manifold of the measurement system more effectively, refreshing the cognitive experience that the installation form of "inlet and outlet on the opposite side" is often adopted in multi-branch manifold to avoid the bias current. Third, the selection of different standby branches influences the bias current. Under the installation form of "inlet and outlet on the same side" at the Heihe initial station, the bias current is the least when the first and second branches are selected as the standby. Fourth, based on analysis results, the installation form of the measurement system at the Heihe initial station is determined and the operation scheme is recommended. In conclusion, the research results are conducive to the accuracy guarantee of the measurement comparison system at the Heihe initial station and ensure the economic benefits of the supply and demand sides. What's more, they provide reference for solving the bias current in the manifolds of other

measurement comparison systems in transnational natural gas trade.
Number of references: 21
Main heading: Finite element method
Controlled terms: Balancing - Bias currents - Commerce - Gases - Installation - Natural gas - Natural gas pipelines
Uncontrolled terms: Accuracy of measurements - Finite element simulations - Gas delivery rate - Measurement comparison - Measurement system - Multiple measurements - Operation schemes - Supply and demand
Classification code: 522 Gas Fuels - 601 Mechanical Design - 701.1 Electricity: Basic Concepts and Phenomena - 921.6 Numerical Methods
DOI: 10.3787/j.issn.1000-0976.2020.10.016
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

63. Key geological factors for shale gas accumulation in the Wufeng-Longmaxi Fms in the central Yangtze area

Accession number: 20202908937726
Title of translation: -
Authors: Chen, Kongquan (1); Li, Junjun (2); Tang, Xiehua (3); Shen, Junjun (1); Wang, Pengwan (4); Peng, Jun (2); Meng, Jianghui (1)
Author affiliation: (1) Hubei Cooperative Innovation Center of Unconventional Oil and Gas of Yangtze University, Wuhan; Hubei; 430100, China; (2) PetroChina Zhejiang Oilfield Company, Hangzhou; Zhejiang; 310013, China; (3) Exploration & Development Institute, PetroChina Zhejiang Oilfield Company, Hangzhou; Zhejiang; 310013, China; (4) PetroChina Hangzhou Research Institute of Geology, Hangzhou; Zhejiang; 310023, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: June 25, 2020
Publication year: 2020
Pages: 18-30
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Upper Ordovician Wufeng Formation and the Lower Silurian Longmaxi Formation in the central Yangtze area of southern China has a good prospect of shale gas exploration. So far, however, its complicated geological conditions and shale gas exploration and development potentials have not been understood completely, which affects its exploration achievements. In order to determine the main factors controlling shale gas enrichment in the Wufeng-Longmaxi Fms in this area, this paper studied the key shale gas enrichment conditions in the black shale there (e.g. sedimentary environments, reservoir development characteristics and preservation conditions) based on single-well comprehensive reservoir evaluation, combined with drilling, logging, core, outcrop and test data. In addition, it was compared with the main shale gas blocks in the Sichuan Basin, such as Jiaoshiba and Changning. And the following research results are obtained. First, the organic-rich shale section in this area was formed during the sedimentation from Wufeng Formation to the third submember of the first Member of Longmaxi Formation. It is the deposit of deepwater continental facies, and its thickness is in a range of 15-39 m, presenting a trend of increasing from south to north. Second, the reservoir rocks in the high-quality shale sections are dominated by siliceous shale, and the reservoir porosity is in a range of 1.60-7.44%. The reservoir spaces are dominated by organic pores with good connectivity and high total organic carbon (TOC) content. The organic matter is of a sapropel-sapropel prone hybrid type, with a high thermal evolution degree, better gas bearing property and good fracability. Third, the Dangyang synclinorium is characterized by better strata preservation, rock occurrence flat, less developed faults and thick and stable roofs and floors, so its shale gas preservation conditions are better. Fourth, different from the Changning and Jiaoshiba Blocks, the central Yangtze area is characterized by great burial depth, large bidirectional stress difference, and low formation pressure coefficient. In conclusion, the Wufeng-Longmaxi Fms is better in shale gas enrichment conditions and has a potential of further exploration. However, its commercial shale gas development and scale production increase in

the future face challenges due to its large stress difference, great burial depth, and lower pressure coefficient.
Number of references: 34
Main heading: Petroleum prospecting
Controlled terms: Deposition - Gas industry - Gases - Geological surveys - Geology - Offshore gas fields - Organic carbon - Petroleum reservoir evaluation - Shale gas
Uncontrolled terms: Central Yangtze areas - Complicated geological conditions - Dangyang synclinorium - Low formation pressure - Preservation condition - Reservoir development - Sedimentary environment - Total Organic Carbon
Classification code: 481.1 Geology - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 802.3 Chemical Operations - 804.1 Organic Compounds
Numerical data indexing: Percentage 1.60e+00% to 7.44e+00%, Size 1.50e+01m to 3.90e+01m
DOI: 10.3787/j.issn.1000-0976.2020.06.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

64. Influence of squeeze-off on the mechanical properties of PE gas pipes

Accession number: 20205209696185
Title of translation:
Authors: Zhang, Yi (1, 2); Xue, Shifeng (1); Han, Limei (1); Liu, Cuiwei (1, 2); Jiao, Junpeng (1)
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Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 135-142
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Squeeze-off is a dedicated pipeline construction and rush repair technology which is designed on the basis of the good toughness of polythene (PE) pipes, and it has been extensively applied in recent years. However, non-standard squeeze-off can bring damage to PE pipes, shorten its service life and even severely impact the safe operation of gas pipes. In order to establish a safe and efficient squeeze-off process and ensure the safe operation of PE gas pipes, this paper investigates the influential laws of squeeze-off on the mechanical properties of PE pipes by means of laboratory experiments and finite element simulation. And the influences of extrusion speed, wall compressibility, size of extrusion rod and friction coefficient between pipe and extrusion rod on the maximum pipe stress and plastic strain are mainly analyzed. And the following research results were obtained. First, the elastic modulus and yield stress at the ear of PE pipes after the application of squeeze-off are only 17% and 72% of the original values. Second, maximum pipe load, stress and plastic strain increase with the increase of extrusion speed and wall compressibility. Third, as the size of the extrusion rod decreases, the maximum extrusion load decreases, but the maximum pipe stress and plastic strain increase significantly. Fourth, reducing the friction coefficient between pipe and extrusion rod is beneficial to the reduction of maximum pipe stress and plastic strain. In conclusion, the squeeze-off can deteriorate the mechanical properties of PE pipes, so it is suggested to apply some necessary protection measures to the squeezed off PE pipes and especially its ear. What's more, increasing the size of extrusion tool and reducing the friction coefficient between pipeline and extrusion rod can lead to the reduction of pipe stress and plastic strain, which is beneficial to the safe operation of PE pipe.
Number of references: 24
Main heading: Plastic pipe
Controlled terms: Compressibility - Extrusion - Friction - Pipelines - Plastic deformation - Yield stress
Uncontrolled terms: Extrusion speed - Extrusion tools - Finite element simulations - Friction coefficients - Laboratory experiments - Pipeline construction - Protection measures - Research results
Classification code: 619.1 Pipe, Piping and Pipelines - 951 Materials Science

Numerical data indexing: Percentage 1.70e+01%, Percentage 7.20e+01%
DOI: 10.3787/j.issn.1000-0976.2020.11.016
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

65. Experimental evaluation on the anti-erosion performance of throttle valves for drilling

Accession number: 20202508844900
Title of translation:
Authors: Cao, Yang (1); Fang, Xiaoqing (1); Zhang, Junlan (1); Tang, Dixiao (1)
Author affiliation: (1) Oilfield Engineering Service Company, Sinopec Southwest Petroleum Engineering Co. Ltd., Mianyang; Sichuan; 621000, China
Corresponding author: Fang, Xiaoqing(fangxq008@163.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: May 25, 2020
Publication year: 2020
Pages: 89-93
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: When a blowout accident happens, throttle valve is the key device to control the flow velocity of fluid in a well, so its erosion resistance shall be stronger. At present, however, the evaluation on the anti-erosion performance of throttle valves mostly focuses on finite element analysis or fluid field simulation calculation, with neither measured data nor qualitative and quantitative evaluation, which brings great difficulties to the selection and application of throttle valves. In this paper, an experimental idea was adopted of adjusting the experimental pressure and fluid velocity based on the remote control of valve opening and keeping the nitrogen injection pressure slightly higher than the experimental pressure to ensure that the gas is effectively mixed to form three-phase fluid. Closed-loop simulation was performed on the erosion of blowout on three kinds of throttle valves (orifice-type throttle valves, cylindrical throttle valves and wedge-shaped throttle valves) under different flow velocities, different fluid components and different pressures. And the following experimental results were obtained. First, from the viewpoint of erosion resistance, three kinds of throttle valves are ranked as a cylindrical throttle valve >a wedge-shaped throttle valve >an orifice-type throttle valve. Second, within the experimental pressure range, a wedge-shaped throttle valve has slight erosion marks on the valve core and unilateral erosion on the downstream nipple, indicating that its erosion resistance is weak. Third, when the opening of an orifice-type throttle valve is 1/8, the experimental pump pressure drops back to 4 MPa for many times, and the rear end of the valve core is seriously eroded. Finally, according to the experimental results, the improvement ideas of changing the core's shape of a wedge-shaped throttle valve, optimizing the material and adding seals on the side of an orifice-type throttle valve were put forward. In conclusion, the three-phase fluid erosion resistance evaluation method can be used to evaluate throttle valves of similar structure. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 17
Main heading: Erosion
Controlled terms: Blowouts - Flow velocity - Orifices - Remote control
Uncontrolled terms: Closed-loop simulations - Different pressures - Erosion resistance - Experimental evaluation - Fluid components - Fluid velocities - Nitrogen injection - Quantitative evaluation
Classification code: 631 Fluid Flow - 731.1 Control Systems - 914.1 Accidents and Accident Prevention
Numerical data indexing: Pressure 4.00e+06Pa
DOI: 10.3787/j.issn.1000-0976.2020.05.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

66. Drilling and completion technologies for deep carbonate rocks in the Sichuan Basin: Practices and prospects

Accession number: 20201208317064
Title of translation:
Authors: Wu, Xianzhu (1, 2); Wan, Fulei (1, 2); Chen, Zuo (1, 2); Han, Liexiang (1, 2); Li, Zhilin (1, 2)
Author affiliation: (1) National Energy R & D Center of High-Sulfur Gas Reservoir Exploitation, Chengdu; Sichuan; 610041, China; (2) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China
Corresponding author: Wan, Fulei(wanfl@cnpc.com.cn)
Source title: Natural Gas Industry
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Volume: 40
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Publication year: 2020
Pages: 97-105
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The exploration and development of oil and gas resources in the Sichuan Basin is shifting to the deeper strata. The deep and ultra-deep wells in deep carbonate gas reservoirs are faced with many difficulties, such as multiple pressure systems, poor drillability, ultra-high pressure, ultra-high temperature and high sulfur content, which bring great challenges to drilling and completion engineering. In order to ensure the smooth exploration and development of deep carbonate oil and gas resources in the Sichuan Basin, the overall concept of combining field practice and technological research is followed. During the 13th Five-Year Plan, a batch of ultra-deep wells (well depth about 8 000 m) have been drilled fast and safely (such as Well SYX133 in the Shuangyushi structure), and great progresses have been achieved in the experimental research of the support technologies in drilling and completion of deep and ultra-deep wells. And the achievements are as follows. First, the optimization of non-standard well structure, combined with the application of precisely managed pressure drilling technology and under-pressure plugging technology, lays a foundation for the optimized fast drilling and the safe reaching of geological targets. Second, a high-efficiency customized PDC drill bit is comprehensively optimized, popularized and applied, which effectively improves the average rate of penetration (ROP) in difficult-to-drill formations. Third, the development and application of drilling fluids (e.g. being resistant to high temperature of 200 and anti-composite brine) and active under-pressure plugging technology effectively reduces downhole complexities while drilling the complex formations, such as high temperature and high pressure brine and circulation loss. Fourth, when precisely managed pressure drilling and precisely managed pressure cementing methods are applied in the strata with a narrow density window, multiple pressure systems and pressure sensitivity, the average drilling and completion fluid loss is reduced by more than 90%, and the complexity treatment time is cut down by more than 85%, and the cementing quality pass rate is increased by more than 20%. Fifth, the integrated application of ROP improvement technologies and tools (e.g. gas drilling) results in a great reduction of drilling cycle and cost. It is concluded that the experimental research achievements provide basic support for the fast development of natural gas resources in the Anyue Gas Field, Sichuan Basin, and the great discovery of the Permian and Devonian natural gas resources in the northwestern Sichuan Basin. What's more, in order to adapt to the development of the deep natural gas (over 9 000 m) in the Sichuan Basin during the 14th Five-Year Plan, it is necessary to speed up researches on drilling and completion technologies in nine aspects, e.g. high-temperature downhole tools and working fluid.
Number of references: 34
Main heading: Natural gas well completion
Controlled terms: Bits - Carbonation - Cementing (shafts) - Drilling fluids - Drills - Energy resources - Gases - High pressure engineering - High temperature engineering - Infill drilling - Natural gas - Natural gas fields - Oil field development - Petroleum prospecting - Reservoir management - Structural optimization
Uncontrolled terms: Drilling and completion - Drilling and completion fluids - Gas reservoir - Managed Pressure Drilling - Sichuan Basin - Ultra-deep wells - Well structure
Classification code: 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 603.2 Machine Tool Accessories - 802.2 Chemical Reactions - 921.5 Optimization Techniques
Numerical data indexing: Percentage 2.00e+01%, Percentage 8.50e+01%, Percentage 9.00e+01%, Size 8.00e+03m, Size 9.00e+03m
DOI: 10.3787/j.issn.1000-0976.2020.02.011
Compendex references: YES

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67. Thermal reservoir characteristics and favorable targets of Ordovician carbonate rocks in the Taiyuan area

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Title of translation:
Authors: Dai, Minggang (1, 2); Lei, Haifei (3); Ling, Anhang (1, 2); Mao, Xiang (1, 2); Wang, Simin (4); Xiang, Caifu (4)
Author affiliation: (1) Sinopec Star Petroleum Co., Ltd., Beijing; 100083, China; (2) China National Center for Geothermal Energy Development Research and Applied Technology Promotion, Beijing; 100083, China; (3) Sinopec Green Energy Geothermal Development Co., Ltd., Xiong'an; Hebei; 071800, China; (4) China University of Petroleum, Beijing, Beijing; 102249, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 143-155
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The geothermal resources of Ordovician carbonate rocks are abundant in the Taiyuan area, Shanxi province. In order to achieve a better understanding of the characteristics, genesis and controlling factors there and guide the exploration of this type of geothermal fields, we studied the development characteristics of Ordovician thermal reservoir rocks, reservoir space types, and diagenesis types in this study area based on the data of core and outcrop observation, thin section and scanning electron microscopy, and revealed the main controlling factors of thermal reservoir characteristics and the most favorable targets. The following results were achieved. (1) The Ordovician thermal reservoirs in the Taiyuan area mainly consist of limestones and dolomites, with karst caves, fractures, and pores as the main reservoir space. (2) The reservoirs are subjected to both destructive and constructive diagenesis, and karstification and dolomitization have dominant influence on the formation of secondary pores. (3) Karstification results in mainly supergene karst and buried karst. The contribution of supergene karstification to reservoirs is dominant, and burial karstification plays a significant role in the later dissolution and transformation of reservoirs, which increases their porosity. (4) Ordovician carbonate reservoirs are generally located in the karst slope zones with a good storage performance on the thermal reservoir plane. The lithology of thermal reservoir aquifers presents usually limestones and dolomites with impure composition and high crystallinity. (5) The development and distribution of thermal reservoir karst pores mainly depend on lithology (including rock composition, texture, thickness, etc.), structure (fracture and unconformity), sedimentary facies, groundwater dynamic conditions, and other controlling factors, especially, tectonic faults control the direction, affecting karst development scale and karst fissure hydrodynamic conditions. It is concluded that the most favorable targets for Ordovician carbonate thermal reservoir karst development in the Taiyuan area are the northwestern and eastern parts of the Jinyuan sag and the central and western parts of the Xiwenzhuang uplift. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 29
Main heading: Landforms
Controlled terms: Aquifers - Carbonates - Carbonation - Crystallinity - Digital storage - Geothermal fields - Groundwater resources - Hydrogeology - Lime - Limestone - Lithology - Petroleum reservoirs - Scanning electron microscopy - Sedimentology - Textures
Uncontrolled terms: Carbonate reservoir - Controlling factors - Development characteristics - Geothermal resources - Groundwater dynamics - Hydrodynamic conditions - Main controlling factors - Storage performance
Classification code: 444.2 Groundwater - 481.1 Geology - 481.3.1 Geothermal Phenomena - 512.1.1 Oil Fields - 722.1 Data Storage, Equipment and Techniques - 802.2 Chemical Reactions - 804.2 Inorganic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.04.018
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

68. Development and application of GW-CP194-80A pressure-maintaining coring tool

Accession number: 20202308799538
Title of translation: GW-CP194-80A
Authors: Yang, Liwen (1); Su, Yang (1); Luo, Jun (1); Sun, Shaoliang (1)
Author affiliation: (1) GWDC Engineering Technology Research Institute, Panjin; Liaoning; 124010, China
Corresponding author: Su, Yang(122474292@qq.com)
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Publisher: Natural Gas Industry Journal Agency
Abstract: Pressure-maintaining coring technology can reduce the loss of hydrocarbon compositions in cores to the uttermost while keeping the cores in the state of original formation pressure, so as to obtain important formation parameters under the conditions of bottom hole, e. g. reservoir fluid saturation. At present, it is the most advanced coring technology with the highest technical difficulty. Compared with foreign similar technical products, however, there is an obvious gap between the domestic existing pressure-maintaining coring tools in two main technical indexes, i. e. core diameter and pressure maintaining capacity. And especially in the aspect of pressure maintaining capacity, domestic products can hardly meet the needs of pressure-maintaining coring operations in deep sea drilling, onshore deep wells and horizontal wells, which limits its application scope and popularity rate. In this paper, GW-CP194-80A tripping-out pressure-maintaining coring tool (hereinafter, "new tool" for short) was designed and developed on the basis of GWY194-70BB pressure-maintaining coring tool. And the following field application results were obtained. First, the diameter of the core taken by the new tool is increased from 70 mm to 80 mm, and the rated pressure maintaining capacity is increased from 20 MPa to 60 MPa by adopting the large-diameter ball valve sealing device of controllable rotation and the high-strength pressure-maintaining inner cylinder. Second, internal-lift differential assembly and upper-lower synchronous sealing mechanism in the new tool effectively solve the closing problem of ball valves and increase the success rate of pressure maintaining in the coring process of high inclination wells and horizontal wells. Third, during the field application of the new tool in 5 wells by 27 barrel times, the average core recovery rate is 87.5% and the success rate of pressure maintaining is 92.6%. In conclusion, the new tool can reach the design target of core diameter and pressure maintaining capacity, meet the needs of pressure maintaining coring in deep sea, deep seated and unconventional oil and gas reservoirs, and provide technical support for the reservoir evaluation and stimulation of conventional and unconventional oil and gas reservoirs.
Number of references: 22
Main heading: Petroleum reservoir evaluation
Controlled terms: Deepwater drilling - Horizontal wells - Offshore gas fields - Petroleum reservoirs - Sealing (closing)
Uncontrolled terms: Development and applications - Formation parameter - Formation pressure - High inclination well - Hydrocarbon compositions - Sealing mechanisms - Technical difficulties - Unconventional oil and gas
Classification code: 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits
Numerical data indexing: Percentage 8.75e+01%, Percentage 9.26e+01%, Pressure 2.00e+07Pa to 6.00e+07Pa, Size 7.00e-02m to 8.00e-02m
DOI: 10.3787/j.issn.1000-0976.2020.04.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

69. Extensional drilling capacity of titanium alloy drill pipes in the long horizontal sections of a shale gas well

Accession number: 20210109725862
Title of translation:

Authors: Zhu, Xiaohua (1); Li, Ke (1); Li, Zhilin (2); Han, Liexiang (2); Chen, Changqing (3)
Author affiliation: (1) College of Electromechanic Engineering, Southwest Petroleum University, Chengdu; 610500, China; (2) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; 610051, China; (3) Bohai NKK Drill Pipe Co., Ltd., Qingxian; 062650, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Language: Chinese
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Shale gas well development follows the direction of greater vertical depth and longer horizontal sections, so the extensional drilling of long horizontal sections has become a bottleneck which restricts the cost effective development of a shale gas well with long horizontal sections in deep strata. And a light-weight drill pipe is one of the schemes that can solve this problem. In order to quantitatively evaluate the extensional drilling capacity of titanium alloy drill pipes in the long horizontal sections of a shale gas well, this paper established a dynamic model of full-size titanium alloy drill string based on the Hamilton principle and obtained its solution using the HHT-α method. Then, the friction reduction, deformation resistance, axial force transmission capacity of titanium alloy drill pipes and their influential factors were analyzed by comparing with steel drill pipes. And the following research results were obtained. First, titanium alloy drill pipes can effectively reduce drill string friction. And when the drilling fluid density is 1.30 g/cm3, the contact friction of Ø101.6 mm titanium alloy drill pipes and Ø127.0 mm titanium alloy drill pipes is 18.5% and 34.8% respectively less than that of Ø101.6 mm steel drill pipes. Second, compared with the steel drill pipes, the titanium alloy drill pipes tend to suffer buckling deformation, which can be alleviated by adjusting its size and specification, so as to reduce its induced local friction. Third, the friction reduction effect of titanium alloy drill pipes can be obviously enhanced by increasing the drilling fluid density. In conclusion, the friction reduction capacity of the light-weight Ø127.0 mm titanium alloy drill pipes is higher than that of Ø101.6 mm titanium alloy drill pipes and much higher than that of Ø101.6 mm steel drill pipes, so it is more beneficial to solving the extensional drilling problem of long horizontal sections.
Number of references: 24
Main heading: Infill drilling
Controlled terms: Cost effectiveness - Deformation - Drill pipe - Drill strings - Drilling fluids - Drills - Friction - Horizontal drilling - Horizontal wells - Natural gas wells - Shale gas - Titanium alloys
Uncontrolled terms: Buckling deformation - Contact - frictions - Deformation resistance - Drilling fluid density - Friction reduction - Hamilton principle - Horizontal section - Influential factors
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 542.3 Titanium and Alloys - 603.2 Machine Tool Accessories - 911.2 Industrial Economics
Numerical data indexing: Mass_Density 1.30e+03kg/m3, Percentage 1.85e+01%, Percentage 3.48e+01%
DOI: 10.3787/j.issn.1000-0976.2020.10.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

70. Theoretical and technological innovation of oil and gas accumulation and major exploration breakthroughs in deep-water areas, northern South China Sea

Accession number: 20210309770784
Title of translation:
Authors: Xie, Yuhong (1); Zhang, Gongcheng (2); Tang, Wu (2); Zhao, Zhao (2)
Author affiliation: (1) China National Offshore Oil Corporation, Beijing; 100010, China; (2) CNOOC Research Institute Co., Ltd., Beijing; 100028, China
Corresponding author: Zhang, Gongcheng(zhanggch@cnooc.com.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.

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Publication year: 2020
Pages: 1-11
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The deep-water areas in the northern South China Sea are rich in oil and gas resources, and is an important oil and gas exploration and development region of China. Over two decades of scientific and technological researches and practices in this region, a series of theories and technologies has been formed. The research results were achieved as follows. (1) The large-scale detachment of the northern continental margin of the South China Sea controlled the formation and evolution of deep-water basins, forming three sets of source rocks (Eocene lacustrine facies, Oligocene marine-continental transitional facies and Oligocene-Miocene marine facies) in the deep-water area of the continental margin. The strong thinning zone of the continental margin lithosphere controlled the paleogeomorphology and sedimentary environment of the northern South China Sea. In the deep-water areas of the Baiyun sag in the Pearl River Mouth Basin and the Qiongdongnan Basin, high-quality reservoirs of continental shelf marginal delta-deep-water fan systems and large-scale central-canyon sedimentary systems were formed. The above three sets of source rocks and multi-types of reservoirs constitute three kinds of oil and gas accumulation models by different transport systems. (2) In view of the problems of poor seismic imaging, difficult reservoir prediction and fluid identification in middle-deep layers of the deep-water area, a set of targeted technologies has been researched and developed, including the "plough-type" cable broadband and stereo vibrator acquisition technology, three-dimensional high-precision gravity, magnetic and seismic joint inversion technology, subsea geophone seismic processing technology and P-S wave joint inversion technology for deep-water oil and gas exploration, and quantitative evaluation technology for deep-water reservoir physical properties and petroleum properties. (3) For lack of key technologies for deep-water drilling, completion and testing, a kind of deep-water exploratory well sidewall active strengthening technology, deep-water surface cluster batch drilling mode, and deep-water large-scale safe and efficient testing modular technology have been thus developed. It is concluded that: (1) the deep-water oil and gas accumulation theory in the northern South China Sea, the geophysical technology system for oil and gas exploration in deep-water area, and the safe and efficient drilling, completion and testing technology in deep-water area have been innovated and established, forming a supporting deep-water oil and gas exploration technology system, which has effectively guided and helped to discover a number of large and medium-sized commercial oil and gas fields, with proved geological reserves of natural gas more than 3 000×108 m3, achieving a historic breakthrough in deep-water oil and gas exploration in China, and (2) the innovation of oil and gas geological theory, the breakthroughs in key bottleneck technologies for geophysics, drilling and production are the necessary conditions for continuous major oil and gas discoveries in the deep-water area of the northern South China Sea. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 43
Main heading: Offshore petroleum prospecting
Controlled terms: Deepwater drilling - Energy resources - Gases - Geological surveys - Infill drilling - Offshore gas fields - Petroleum geology - Petroleum reservoir evaluation - Petroleum transportation - Proven reserves - Reserves to production ratio - Sedimentology - Seismology - Shear waves - Stereo image processing - Technology transfer - Water resources - Well testing
Uncontrolled terms: Formation and evolutions - Geophysical technologies - Northern South China Sea - Oil and gas accumulation - Quantitative evaluation - Strengthening technologies - Technological innovation - Technological researches
Classification code: 444 Water Resources - 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 525.1 Energy Resources and Renewable Energy Issues - 723.2 Data Processing and Image Processing - 931.1 Mechanics
DOI: 10.3787/j.issn.1000-0976.2020.12.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

71. Key technologies for the integration of deepwater natural gas exploration and development and their application in the Qiongdongnan Basin

Accession number: 20210309770778
Title of translation:
Authors: Chen, Kui (1); Song, Ruiyou (1); Han, Guangming (1); Xu, Tao (1); Zheng, Fei (1); He, Yan (1); Dou, Jingying (1); Zhan, Yeping (1)
Author affiliation: (1) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: December 25, 2020
Publication year: 2020
Pages: 59-70
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The central canyon in the deepwater area of the Qiongdongnan Basin faces some problems in the exploration and development of deepwater natural gas, such as high exploration and development cost and difficult production of some proved and controlled geological reserves. In order to solve these difficulties and promote the efficient exploration and development of deepwater gas fields in this area, this paper studied the key technologies for the integration of deepwater natural gas exploration and development in this area based on reservoir geological and geophysical data, including target search technology, target evaluation technology and target drilling technology. And the following research results were obtained. First, target search technology not only includes the "zonal potential target search technology" under the guidance of regional law, but also "search technology during target evaluation" and "search technology during tracking while drilling" which are formed in the process of target evaluation and tracking while drilling. And after searching, 17 potential targets are totally selected and the determined potential natural gas resource is about 1 600×108 m3. Second, target evaluation technology makes use of various technological means to analyze the selected potential targets from the aspects of trap, sedimentary reservoir, hydrocarbon accumulation condition, resource prediction, development scheme and well arrangement. And Kuai 4 structure of L17 Gasfield, L18-4 structure of L18 Gasfield and L25W structure of L25 Gasfield are selected for further treatment. Third, target drilling technology can upgrade controlled reserves and increase reserves and production in flexible drilling modes of appraisal well, such as exploration mode and development mode. And four treated wells are successful with 130 m gas layers drilled, accelerating the process of gas field development. In conclusion, the application of exploration-development integrated technology can not only clarify the hydrocarbon accumulation laws of main gas bearing series of strata in this area, but also shorten the exploration and development cycle and improve reserve producing degree and efficiency.
Number of references: 31
Main heading: Offshore petroleum prospecting
Controlled terms: Energy resources - Gases - Geological surveys - Geology - Hydrocarbons - Infill drilling - Natural gas - Offshore gas fields - Petroleum reservoir evaluation - Proven reserves
Uncontrolled terms: Drilling technology - Exploration and development - Gas field development - Hydrocarbon accumulation - Integrated technologies - Natural gas exploration - Natural gas resources - Sedimentary reservoirs
Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 804.1 Organic Compounds
Numerical data indexing: Size 1.30e+02m
DOI: 10.3787/j.issn.1000-0976.2020.12.007
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

72. Transverse bearing behaviors of strings and risers in deepwater tests

Accession number: 20210309770796
Title of translation:
Authors: Sun, Qiaolei (1, 2); Li, Zhong (3); Wang, Erjun (3); Feng, Ding (1, 2); Chen, Wenkang (1, 2); Liu, Tongliang (1); Yan, Chunti (1)
Author affiliation: (1) School of Mechanical Engineering, Yangtze University, Jingzhou; 434023, China; (2) Hubei Engineering Research Center for Oil & Gas Drilling and Completion Tools, Jingzhou; 434023, China; (3) CNOOC Research Institute Co., Ltd., Beijing; 100028, China

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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 106-115
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Risers and test strings interact with seawater, annulus fluid and internal fluid in the process of offshore deepwater oil and gas testing, thus a "pipe-in-pipe" structure system is formed, however, the complex transverse bearing behaviors generated by the riser-test string system are not understood sufficiently. In order to provide theoretical support for the control of offshore safety testing operation, this paper established a model for calculating the wellbore temperature field, pressure field and axial force of test string in seawater section in view of the characteristics of the "pipe-in-pipe" structure system applied in the testing operation and the operating water depth over 900 m in the South China Sea. Then, considering the interaction between internal and external fluid and string, a transverse dynamic force model of risers and test strings was established. Finally, the transverse bearing behaviors of the "pipe-in-pipe" structure system under different top tensions, hanging forces, current velocities and platform drifts were analyzed using the numerical method. And the following research results were obtained. First, increasing top tension and hanging force can reduce the transverse bearing parameters of the string system, and the influence of top tension on the transverse bearing parameters of the string system is more obvious under the same amplitude. Second, with the increase of current velocity, the maximum transverse displacement, rotation angle and bending moment of the string system increase obviously. Third, with the increase of platform drift, the maximum rotation angle and bending moment of the string system decrease first and then increase. That is to say, appropriate platform drift along the current direction is conducive to reducing the maximum transverse bearing parameters of the string system. In conclusion, the research results provide theoretical support for the safety control of offshore testing operations. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 43
Main heading: Safety testing
Controlled terms: Bending moments - Marine risers - Numerical methods - Offshore boreholes - Offshore oil well production - Offshore pipelines - Oil wells - Seawater - Well testing
Uncontrolled terms: Bearing behaviors - Current direction - Current velocity - Research results - Structure systems - Transverse displacements - Transverse dynamics - Wellbore temperature
Classification code: 408.2 Structural Members and Shapes - 471.4 Seawater, Tides and Waves - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 914.1 Accidents and Accident Prevention - 921.6 Numerical Methods
Numerical data indexing: Size 9.00e+02m
DOI: 10.3787/j.issn.1000-0976.2020.12.012
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

73. Comparison and implications of ROP improvement technologies in typical high-pressure shale gas reservoirs in America and China

Accession number: 20200908220924
Title of translation:
Authors: Qiao, Lihua (1, 2); Fan, Shenglin (1, 2); Qi, Yu (1, 2)
Author affiliation: (1) Drilling & Production Engineering Technology Research Institute, CNPC Chuanqing Drilling Engineering Company Limited, Guanghan; Sichuan; 618300, China; (2) Drilling and Completion Technology R & D Department of National Energy shale gas R & D Center, Guanghan; Sichuan; 618300, China
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Abbreviated source title: Natur. Gas Ind.
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Issue date: January 25, 2020

Publication year: 2020
Pages: 104-109
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Haynesville high-pressure shale gas reservoir in America and the high-pressure shale gas reservoir of Lower Silurian Longmaxi Formation in the Changning-Weiyuan national shale gas demonstration area in China are similar in geological and drilling conditions. The technical ideas for improving the rate of penetration (ROP) in the Haynesville high-pressure shale gas reservoir provide an important reference for the fast drilling of shale gas wells in China. In order to realize ROP improvement of shale gas reservoirs in China, this paper compares the ROP improvement technologies used in the typical high-pressure shale gas reservoir in China and in America, and analyzes and discusses the similarities and differences of ROP improvement technologies used in the Haynesville high-pressure shale gas reservoir in America and the high-pressure shale gas reservoir of Lower Silurian Longmaxi Formation in the Changning-Weiyuan national shale gas demonstration area in China. And the following research results were obtained. First, the hole size of the horizontal section in the Haynesville high-pressure shale gas reservoir is currently reduced from 215.9 mm to 171.5 mm or 161.1 mm, the single-well drilling investment is decreased by over 25%, showing an obvious advantage in energy conservation and emission reduction. Second, it is worthywhile for China to pay attention to, refer to, research and apply the ROP improvement technology of "efficient drilling bit + support downhole ROP improvement tool + drilling parameter optimization software/equipment" for high-abrasivity hard-to-drill formations used by American counterparts. Third, the drilling technology of "managed pressure drilling + density reduction" can play an important role in improving the ROP in high-pressure shale intervals. In conclusion, it is necessary to actively carry out exploratory tests on the reduced hole structure size and the application of related support drilling equipment, tool and software in the national shale gas demonstration areas of China, and explore, optimize and apply the managed pressure drilling technology continuously in the target intervals. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 23
Main heading: Reservoir management
Controlled terms: Application programs - Boreholes - Demonstrations - Drilling equipment - Drills - Emission control - Gases - Horizontal wells - Infill drilling - Investments - Shale gas - Software testing - Well drilling
Uncontrolled terms: Changning-Weiyuan national shale gas demonstration area - Drill formations - Gas reservoir - Hole structures - Managed Pressure Drilling - ROP improvement - Technological comparison
Classification code: 451.2 Air Pollution Control - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 603.2 Machine Tool Accessories - 723 Computer Software, Data Handling and Applications - 723.5 Computer Applications
Numerical data indexing: Percentage 2.50e+01%, Size 1.61e-01m, Size 2.16e-01m to 1.72e-01m
DOI: 10.3787/j.issn.1000-0976.2020.01.014
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

74. Pore structures and fractal characteristics of liquid nitrogen adsorption pores in lignite in the Hailar Basin

Accession number: 20202508845109
Title of translation:
Authors: Shao, Longyi (1); Li, Jiaxu (1); Wang, Shuai (1); Hou, Haihai (2); Li, Jian'an (1); Zhu, Mingyu (1)
Author affiliation: (1) College of Geoscience and Surveying Engineering, China University of Mining and Technology, Beijing; 100083, China; (2) College of Mines, Liaoning Technical University, Huludao; Liaoning; 125105, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 15-25
Language: Chinese
ISSN: 10000976

CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The fractal dimension calculation method can be used to accurately and quantitatively describe pore structures in coal. In order to characterize the pore structures of adsorption pores in lignite in the Hailar Basin, this appear analyzed the pore structures of a dsorption pores in the coal reservoirs of the study area by means of low temperature nitrogen adsorption experiments and scanning electron microscope (SEM). In addition, the fractal dimensions of adsorption pores in the coal samples were calculated using FHH (Frenkel-Halsey-Hill) model, and the relationships of maximum vitrinite reflectance (Ro, max) and fractal dimension vs. coal quality, pore specific surface area and total pore volume were discussed. And the following research results were obtained. First, the adsorption-desorption curves of coal samples in the study area can be divided into 3 types, i.e., type A, B and C. Second, type A pores are morphologically open parallel plate pores and cylinder pores with a large specific surface area and total pore volume and a small average pore diameter. Third, type B pores are morphologically open parallel plate pores and wedge shaped pores with a small specific surface area and total pore volume and a large average pore diameter. Fourth, type C pores are morphologically parallel plate pores and wedge shaped pores with one end closed, which have a small specific surface area and a large total pore volume and average pore diameter. Fifth, the fractal dimension of coal pore surface (D1) has no relationship with moisture content, a positive correlation with ash yield rate, a "U" shaped relationship with fixed carbon content and an inverted "U" shaped relationship with Ro, max. Sixth, the factional dimension of pore structure (D2) has a negative correlation with moisture content, a positive correlation with ash yield rate, a "U" shaped relationship with fixed carbon content and no relationship with Ro, max.
Number of references: 40
Main heading: Fractal dimension
Controlled terms: Carbon - Coal tar - Coking properties - Gas adsorption - Lignite - Liquefied gases - Moisture - Moisture determination - Plates (structural components) - Pore structure - Scanning electron microscopy - Specific surface area - Temperature
Uncontrolled terms: Adsorption desorption - Fractal characteristics - Large specific surface areas - Low-temperature nitrogen - Negative correlation - Nitrogen adsorption - Positive correlations - Vitrinite reflectance
Classification code: 408.2 Structural Members and Shapes - 411.2 Coal Tar - 524 Solid Fuels - 641.1 Thermodynamics - 802.3 Chemical Operations - 804 Chemical Products Generally - 921 Mathematics - 931.2 Physical Properties of Gases, Liquids and Solids - 944.2 Moisture Measurements
DOI: 10.3787/j.issn.1000-0976.2020.05.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

75. Optimization of shale-gas horizontal well spacing based on geolo-gy-engineering-economy integration: A case study of Well block Ning 209 in the National Shale Gas Development Demonstration Area

Accession number: 20203509114435
Title of translation: ---209
Authors: Yong, Rui (1); Chang, Cheng (2); Zhang, Deliang (2); Wu, Jianfa (2); Huang, Haoyong (2); Jing, Daijiao (3); Zheng, Jian (4)
Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Shale Gas Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (3) Natural Gas Economics Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (4) Sichuan Changning Natural Gas Development Co., Ltd., Chengdu; Sichuan; 610056, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: July 25, 2020
Publication year: 2020
Pages: 42-48
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency
Abstract: In order to maximize the resource utilization rate, it is common to adopt one-time overall deployment of well pattern to develop shale gas, and the design of horizontal well spacing is the key to the deployment of shale gas well pattern. To determine the optimal well spacing, it is not only necessary to understand both geological characteristics and drilling fracturing technology, but also take into consideration the influences of economic factors, such as gas price and cost. At present, there is no reliable method for designing the well spacing of shale-gas horizontal wells at home and abroad. In this paper, a method for analyzing the well spacing of shale-gas horizontal wells based on the integration of geology, engineering and economy was established for the first time. Then, by means of geological modeling, numerical simulation and cash flow analysis, the well spacing of shale-gas development wells in Well block Ning 209 in Changning-Weiyuan National Shale Gas Demonstration Area in the Sichuan Basin was comprehensively evaluated by using estimated ultimate reserve (EUR), recovery factor and internal rate of return (IRR). And the following research results were obtained. First, under the current geological, engineering and economic conditions of Well Block Ning 209, the IRR of shale gas platform development can be kept greater than 8% if the well spacing is larger than 240 m. Second, when the well spacing is controlled between 330 m and 380 m, single well EUR, recovery rate of the platform and economic benefit can be considered simultaneously. In conclusion, the research results support the formulation of the shale gas development technology policy of Well Block Ning 209 and lay a foundation for the realization of its scale efficient development of shale gas.
Number of references: 19
Main heading: Well spacing
Controlled terms: Earnings - Economic and social effects - Gases - Geology - Horizontal wells - Proven reserves - Shale gas
Uncontrolled terms: Cash flow analysis - Drilling fracturing - Economic condition - Engineering economy - Geological characteristics - Geological modeling - Internal rate of return - Resource utilizations
Classification code: 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 911.2 Industrial Economics - 971 Social Sciences
Numerical data indexing: Percentage 8.00e+00%, Size 2.40e+02m, Size 3.30e+02m to 3.80e+02m
DOI: 10.3787/j.issn.1000-0976.2020.07.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

76. Stimulation experiment of horizontal wells filled with permeable and water-blocking gravel in deepsea bottom-water gas reservoirs

Accession number: 20200908220965
Title of translation:
Authors: Liu, Yikun (1); Wang, Haidong (1); Meng, Wenbo (2); Zhang, Chong (2); Zhi, Jiqiang (1); Shen, Anqi (1)
Author affiliation: (1) Key Laboratory of Ministry of Education of China on Enhanced Oil and Gas Recovery, Northeast Petroleum University, Daqing; Heilongjiang; 163318, China; (2) CNOOC China Limited Zhanjiang Branch, Zhanjiang; Guangdong; 524051, China
Corresponding author: Wang, Haidong(18249001311@163.com)
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 61-68
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to find an economic and effective water control method for horizontal wells in deepsea bottom-water gas reservoirs, we prepared modified coated gravel. And based on this, wear resistance, temperature resistance and water plugging capacity (WPC) tests were carried out on the coated gravel. Then, experiments were carried out using the 3D simulation device for the development of large-scale bottom-water gas reservoirs to compare the development effects of horizontal wells packed with conventional gravel and coated gravel in deepsea bottom-water gas reservoirs.

And the following research results were obtained. First, the upper limit of temperature resistance of the gravel coating is 240 and the gravel packing speed can reach 4.48 m/s, which is 8 times the average flow velocity of gravel packing in actual open hole sections. Second, as the permeability of the coated gravel packing layer increases, its WPC gets weak. When the permeability is lower than 1 500 mD and the displacement pressure difference is lower than 0.6 MPa, the WPC of the coated gravel packing layer is between 0.17 and 0.68. Third, the coated gravel layer functions as gas permeability and water plugging, so the horizontal well technology with coated gravel packing can reduce the flow capacity of water phase breaking into the dominant flow passage, so as to delay the rise of water production of gas well and prolong the gas production time. In this way, the gas recovery factor of bottom-water gas reservoir can be increased effectively. In conclusion, this technology has the function of spontaneous selective water plugging, i.e., "water plugging in case of water and gas permeability in case of gas", and its technical and economic advantages are remarkable, which can provide a new idea for the water-control development of deepsea bottom-water gas reservoirs.

Number of references: 18
Main heading: Gas permeability
Controlled terms: Coatings - Economic and social effects - Flow velocity - Gas industry - Gases - Gravel - Horizontal wells - Natural gas well production - Petroleum reservoir engineering - Petroleum reservoirs - Temperature control - Wear resistance - Well stimulation
Uncontrolled terms: Bottom water - Damage resistance - Deepsea - Development and stimulation - Gravel packing - Recovery factors - Water plugging
Classification code: 512 Petroleum and Related Deposits - 522 Gas Fuels - 631 Fluid Flow - 731.3 Specific Variables Control - 813.2 Coating Materials - 931.2 Physical Properties of Gases, Liquids and Solids - 971 Social Sciences
Numerical data indexing: Velocity 4.48e+00m/s, Pressure 6.00e+05Pa
DOI: 10.3787/j.issn.1000-0976.2020.01.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

77. Application of fishing coiled tubing by using coiled tubing in gas wells with low pressures and low production rates

Accession number: 20200908220926
Title of translation:
Authors: Pang, Dexin (1); Abulimiti, Aibaibu (1); Zhu, Zhaozhao (1); Guo, Xinwei (1); Yang, Wenxin (1); Hao, Libo (1)
Author affiliation: (1) PetroChina Xinjiang Oilfield Company, Karamay; Xinjiang; 834000, China
Corresponding author: Abulimiti, Aibaibu(aibaibu@163.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 1
Issue date: January 25, 2020
Publication year: 2020
Pages: 76-82
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to solve the problem of coiled tubing fishing in the production string of gas wells with low pressures and low production rates, this paper puts forward a technical idea of fishing coiled tubing by using coiled tubing. Combined with the actual characteristics of gas wells with low pressure and low production, a series of special fishing tools were developed. And the technology was applied to Well T1 of Yangtake Condensate Gas Field in the western end of Luntai salient, Tabei uplift, the Tarim Basin. And the following research results were obtained. First, the necessary prerequisite for the smooth fishing operation is to unblock the operating channel by jet flow, verify the shape of the fish top by lead-in printing and determine the normal lifting load range by pull-up tests. Second, by virtue of the spin-in tool, the rotation fishing function of coiled tubing can be realized. By virtue of the catching-cutting tool, the dual purpose of catching fish and cutting fish in extreme cases can be achieved, so as to prevent the operation string from being broken and falling, which may cause a severe downhole accident. Based on the change of pump pressure, the capture detection tool can detect whether the fish top is introduced or not in time, effectively avoiding the situation that the fish is squeezed and broken due to blind loading in the introduction process. Third, Well T1, a gas well with

low pressure and low production rate, has been shut down for a long time and its production channel is completely blocked. In addition, there are many variable diameter positions in the operation channel. After this fishing technology is applied in Well T1 for fishing 13 times, the fish top is successfully introduced and fished with a success rate of 100%. In conclusion, this technology is applicable to coiled tubing fishing under the condition of limited space, and it provides an effective solution for the difficult fishing of coiled tubing in the production string of gas wells with low pressures and low production rates.
Number of references: 16
Main heading: Coiled tubing
Controlled terms: Boreholes - Corrosion - Cutting tools - Fish - Fishing (oil wells) - Gas condensates - Gas industry - Gases - Natural gas well production - Natural gas wells - Oil field equipment
Uncontrolled terms: Condensate gas - Low pressures - Research and development - Tarim Basin - Velocity string
Classification code: 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 603.2 Machine Tool Accessories - 619.1 Pipe, Piping and Pipelines
Numerical data indexing: Percentage 1.00e+02%
DOI: 10.3787/j.issn.1000-0976.2020.01.010
Compendex references: YES
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Data Provider: Engineering Village

78. Structural deformation laws and oil & gas exploration direction in the western Kelasu tectonic zone of the Tarim Basin

Accession number: 20200908220889
Title of translation:
Authors: Yang, Haijun (1); Sun, Xiongwei (1); Pan, Yangyong (1); Tang, Yongliang (1); Li, Xiangyun (1); Qu, Yuanji (1); Jin, Jiangning (1); Wu, Junlin (2)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China; (2) Yingmai Oil and Gas Development Department, PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The western section of Kelasu tectonic zone in the Kuqa Depression of the Tarim Basin is faced with a series of difficulties such as complicated deformation, poor deep reservoir seismic imaging, difficult trap discovery and confirmation and low oil & gas exploration and development degree. In order to speed up the oil and gas exploration in this area, this paper analyzed the structural deformation characteristics in different sections of the Kelasu tectonic zone based on previous research results, combined with the latest drilling information and high-quality 3D seismic data. Then, differential structural deformation laws, structural deformation characteristics and structural patterns of the Kelasu tectonic zone were studied, and the reasons for the intensive development of pop-up structures in the Keshen fault belt were analyzed. Finally, the oil & gas exploration direction in this area in the next step was pointed out. And the following research results were obtained. First, the differential structural deformation laws are controlled by three major factors in different sections, namely plastic gypsum-salt rock, regional compression stress and basement pre-structure. Second, under the effect of twin salt lakes, wedge-shaped thrust imbricated structures are developed in the Dabei Block. Third, the Bozi-Dabei Block is under the joint effect of oblique compressions, twin salt lakes and paleo-uplifts, and complete pop-up structures, large-scale echelon nappe structures and wedge-shaped thrust imbricated structures are developed. Fourth, the Bozi Block is hindered mainly by the paleo-uplift, and broken pop-up structures are developed. Fifth, the structural transition zone of Awate-Bozi Block is mainly affected by oblique compression stress and single salt lake, and wedge-shaped thrust imbricated structures are developed. In conclusion, pop-up structure group and echelon trap group that are generally developed in the Keshen fault belt and the Baicheng fault

belt have huge oil & gas exploration and development potential, so they are the important exploration objects in this area.
Number of references: 15
Main heading: Petroleum prospecting
Controlled terms: Buildings - Deformation - Faulting - Gases - Geological surveys - Gypsum - Lakes - Salt deposits - Seismology
Uncontrolled terms: Bozi Block - Compressionstress - Echelon - Gypsum-salt rocks - Structural transitions - Tarim Basin
Classification code: 402 Buildings and Towers - 481.1 Geology - 482.2 Minerals - 484.1 Earthquake Measurements and Analysis - 505.1 Nonmetallic Mines - 512.1.2 Petroleum Deposits : Development Operations
DOI: 10.3787/j.issn.1000-0976.2020.01.004
Compendex references: YES
Database: Compendex

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79. Finite element analysis on the nonlinear static force of Menggang River large suspension cable crossing pipeline under the finished state of bridge

Accession number: 20200908220933
Title of translation:
Authors: Peng, Yang (1); An, Jianchuan (1); Li, Ming (1); Yu, Jin (2); Li, Changjun (3)
Author affiliation: (1) Gas Management Office, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610215, China; (2) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610056, China; (3) Petroleum Engineering School, Southwest Petroleum University, Chengdu; Sichuan; 610500, China
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Publication year: 2020
Pages: 125-131
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Menggang River suspension cable crossing pipeline of the natural gas pipeline engineering from Chuxiong of Yunnan to Panzhihua of Sichuan is erected directly across the river, so the deformation and stress induced in the process of pigging shall not be ignored. In order to clarify the initial conditions of pigging dynamic response characteristics, it is necessary to perform finite element analysis on the nonlinear static force under the finished state of bridge. In this paper, a 1:1 simulation model was firstly established based on the ANSYS Workbench software. Then, the stresses in different sections of the crossing structure under its own gravity load at a certain arch height were analyzed. Finally, by applying different static loads on the crossing line pipe, the stress and displacement of the line pipe were calculated and checked. And the following research results were obtained. First, the stress and displacement of the established simulation model of crossing structure with a certain arch height under its own gravity are lower than the allowable value, and the deviation from the field test data is smaller. Second, the maximum stress position of the line pipe under the working condition of pressure test appears at the beginning of the arch at the south bank bridge deck rather than at the center of the pipe. Third, with the increase of the applied load, the maximum stress and the displacement of the line pipe increase, but the overall displacement changes less and the stress first reaches the allowable stress value. Fourth, due to the influence of arch height, the displacement change of each part and the position of the ultimate stress of the crossing line pipe under external load have particularity. In conclusion, the research results lay a foundation for the subsequent researches on the pigging dynamic response of the same type of crossing structures.
Number of references: 23
Main heading: Crossings (pipe and cable)
Controlled terms: Arch bridges - Arches - Cable suspended roofs - Cables - Computer software - Dynamic response - Finite element method - Gas engineering - Natural gas - Natural gas pipelines - Nonlinear analysis - Rivers - Stresses

Uncontrolled terms: Deformation and stress - Displacement - Dynamic response characteristics - Initial conditions - Nonlinear statics - Simulation calculation - Stress and displacements - Suspension cables
Classification code: 401.1 Bridges - 408.2 Structural Members and Shapes - 522 Gas Fuels - 723 Computer Software, Data Handling and Applications - 921.6 Numerical Methods
DOI: 10.3787/j.issn.1000-0976.2020.01.017
Compendex references: YES
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Data Provider: Engineering Village

80. Main types and formation mechanisms of marine carbonate reservoirs in the Ordos Basin

Accession number: 20205209695359
Title of translation:
Authors: Zhou, Jingao (1, 2); Fu, Jinhua (3); Yu, Zhou (1); Wu, Dongxu (1); Ding, Zhenchun (1); Li, Weiling (1); Tang, Jin (4)
Author affiliation: (1) PetroChina Hangzhou Research Institute of Geology, Hangzhou; 310023, China; (2) CNPC Key Laboratory of Carbonate Reservoirs, Hangzhou; 310023, China; (3) PetroChina Changqing Oilfield Company, Xi'an; 710018, China; (4) China University of Petroleum, Beijing, Beijing; 102249, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Pages: 20-30
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The macroscopic distribution laws and favorable distribution zones of marine carbonate reservoirs in the Ordos Basin have not been understood clearly, so it is difficult to meet the needs of zone evaluation and target selection. To this end, this paper discusses deeply the characteristics, formation mechanisms and distribution laws of marine carbonate reservoirs in the Ordos Basin based on outcrop, drilling and geophysical data, combined with experimental analysis data, and then accordingly points out the direction of the next natural gas exploration. And the following research results were obtained. First, two types of dolomite reservoirs are mainly developed in the marine carbonate rocks of the Ordos Basin, i.e., karst dolomite reservoirs and grain beach dolomite reservoirs. Karst dolomite reservoirs are developed in the gypsum-bearing dolomite and gypseous dolomite flat microfacies of evaporative platform, and it is mainly distributed in the upper assemblage of the fifth Member of Lower Ordovician Majiagou Formation (O1M5), the O1M1 and the O1M3. Grain beach dolomite reservoirs are mainly developed in the marginal platform grain beach microfacies and the intra-platformgrain beach microfacies, and it is distributed in the Zhangxia Formation of Middle Cambrian, the Sanshanzi Formation of Upper Cambrian, the O1M4 and the middle assemblage of O1M5. Second, the lithology of grain beach reservoirs is oolitic dolomite, doloarenite, crystalline dolomite and microbial dolomite. Its reservoir space is mainly acted by residual intergranular (dissolved) pores, microbial framework (dissolved) pores, intercrystalline(dissolved) pores and karst caves with a small number of fractures, and the porosity ranges from 2.00% to 18.03%, averaging 6.16%. Mechanical sedimentation and microbial mounding are the important formation mechanisms of primary pores, penecontemporaneous dissolution and weathering crust karstification in the exposure period are the main factors controlling the formation of dissolved pores and karst caves, and the early dolomitization and sealing system are favorable for the preservation of pores. Third, the lithology of karst reservoirs is fine-silt crystalline dolomite containing anhydrite moldic pores and silt crystalline dolomite. Its reservoir space is mainly acted by anhydrite moldic pores, karst caves and micro-fractures, and the porosity ranges from 2.00% to 16.36%, averaging 5.98%. Inter-layer karstification in the syngenetic period and weathering crust karstification in the exposure period are the main formation mechanisms of anhydrite moldic pores, and the mineral filling and sealing system are two major factors controlling the preservation of anhydrite moldic pores. In conclusion, the favorable reservoirs are mainly distributed in the areas of Eketuoqianqi-Dingbian-Shanghan, Taolimiao-Wuqi and Yulin-Zhidan, and Taolimiao-Wuqi and Yulin-Zhidan areas are the most favorable zones for deep carbonate gas exploration. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 39

Main heading: Petroleum reservoir evaluation
Controlled terms: Beaches - Carbonation - Caves - Dissolution - Geological surveys - Lithology - Metamorphic rocks - Petroleum prospecting - Petroleum reservoirs - Porosity - Silt - Sulfate minerals - Textures - Weathering
Uncontrolled terms: Dolomite reservoirs - Experimental analysis - Formation mechanism - Lower ordovician - Majiagou formation - Marine carbonate rock - Marine carbonates - Natural gas exploration
Classification code: 407.3 Coastal Engineering - 481.1 Geology - 482.2 Minerals - 483.1 Soils and Soil Mechanics - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 802.2 Chemical Reactions - 802.3 Chemical Operations - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Percentage 2.00e+00% to 1.64e+01%, Percentage 2.00e+00% to 1.80e+01%, Percentage 5.98e+00%, Percentage 6.16e+00%
DOI: 10.3787/j.issn.1000-0976.2020.11.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

81. Identification and characterization of multi-scale pores, vugs and fractures in carbonate reservoirs: A case study of the Middle Permian Qixia dolomite reservoirs in the Shuangyushi Structure of the northwestern Sichuan Basin

Accession number: 20201708556877
Title of translation: --
Authors: Wang, Junjie (1); Hu, Yong (2); Liu, Yicheng (1); He, Puwei (1); Lan, Xuemei (1); Wen, Wen (1)
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Publication year: 2020
Pages: 48-57
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: As for the carbonate reservoirs with strong heterogeneity and multi-scale reservoir spaces, it is difficult to identify all the reservoir spaces using only one single test method. In order to provide technical support for a fine characterization and efficient development of carbonate oil and gas reservoirs, this paper took the dolomite reservoir of Middle Permian Qixia Formation in the Shuangyushi structure of the northwestern Sichuan Basin as the research object. Considering there are multi-scale pores, vugs and fractures developed in the reservoir, core image acquisition instrument and dual-energy CT were used to characterize pores, vugs and fractures in the cores of different scales, and the 3D visualization software was applied to quantitatively analyze the reconstructed pore spaces. In this way, the characterization of the matching relationship of pores, vugs and fractures at different scales and the division of reservoir types were realized, and a set of methods for fracture and vug identification based on geometric parameters was developed. And the following research results were obtained. First, multi-scale reservoir spaces of pores, vugs and fractures are developed in the reservoirs of Qixia Formation in this area, and they can be divided into 6 types of 3 categories. Pores are dominated by intercrystalline dissolution pores and intergranular pores, vugs are mainly small ones, and fractures are mainly diagonal fractures. Second, a set of methods for fracture and vug identification based on geometric parameter is set up. And it takes the sphericity 2 mm as the vug identification standard. Third, the pores in the reservoirs of Qixia Formation are mainly large pores with a diameter ranging from 0.02 to 2.00 mm, the vugs are mainly small with a diameter ranging from 2.00 to 10.00 mm, and fractures of multiple scales are developed. Fourth, the Qixia Formation dolomite reservoirs are mainly of fracture-vug type and fracture-pore type. The development degree of fractures and vugs is a key factor affecting the physical properties of the Qixia Formation reservoirs. The reservoir types with developed fractures in the Qixia Formation account for more than 50%. Therefore, its percolation capacity is better. © 2020, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24
Main heading: Fracture
Controlled terms: Carbonation - Computerized tomography - Parameter estimation - Petroleum reservoir engineering - Petroleum reservoirs - Solvents - Testing - Textures - Three dimensional computer graphics
Uncontrolled terms: Carbonate reservoir - Development degree - Dolomite reservoirs - Fracture identification - Intergranular pores - Oil and gas reservoir - Strong heterogeneities - Technical support
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 723.5 Computer Applications - 802.2 Chemical Reactions - 803 Chemical Agents and Basic Industrial Chemicals - 951 Materials Science
Numerical data indexing: Percentage 5.00e+01%, Size 2.00e-03m to 1.00e-02m, Size 2.00e-05m to 2.00e-03m
DOI: 10.3787/j.issn.1000-0976.2020.03.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

82. Influence of radial vibration on the torque and drag of rotary drill string

Accession number: 20205009619784
Title of translation:
Authors: Li, Zifeng (1); Zhang, Chaoyue (1); Ren, Wenming (1); Ma, Jianwei (1)
Author affiliation: (1) Petroleum Engineering Institute, Yanshan University, Qinhuangdao; 066004, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 80-86
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Extended reach well has already been used widely in the exploration and development of unconventional oil and gas resources, but in the drilling process of its high-angle holding section, the drill string will get failed easily if the torque is too large. At present, the influence laws of radial vibration of horizontal section on the torque and drag of rotary drill string is rarely studied, while studies mostly focus on the development of radial vibration tools and the measurement of friction coefficient. After analyzing the influence principles of radial vibration on the torque and drag of rotary drill string, this paper designed different types of drill pipe wear reduction joint models with elliptical section. Then, the independently developed experimental device for testing the performance of torque and drag reducing tool was adopted to test the torque of the horizontal rotary drill string installed with different drill pipe joint models under different rates of penetration (ROP) and rotary speeds. Finally, the influence laws of radial vibration on the torque and drag of drill string were explored. And the following research results were obtained. First, as the radius ratio of major axis to minor axis of the elliptical section in the drill pipe joint increases, the average torque and the maximum torque fluctuation amplitude decrease first and then increase. When the radius ratio of major axis to minor axis reaches 1.065, the average torque and the maximum torque fluctuation amplitude decrease greatly, leading to an reduction of torque and drag. Second, the average torque can be decreased by decreasing ROP and rotary speed. Third, after the rotary speed exceeds 45 r/min, the maximum torque amplitude changes little with further increase of the rotary speed. Fourth, the fundamental frequency of torque fluctuation is in a nearly linear relation with the rotary speed, but no relation with ROP and radius ratio of major axis to minor axis. In conclusion, the research results can provide guidance for the design and application of drill pipe joints in extended reach wells and horizontal wells. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 22
Main heading: Drill strings
Controlled terms: Drag reduction - Drill pipe - Drills - Energy resources - Friction - Horizontal wells - Infill drilling - Oil field development - Oil well drilling - Petroleum prospecting - Pipe joints - Speed - Torque - Vibration analysis
Uncontrolled terms: Design and application - Experimental devices - Exploration and development - Extended reach well - Fundamental frequencies - Measurement of friction - Rates-of-penetration - Unconventional oil and gas

Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 525.1 Energy Resources and Renewable Energy Issues - 603.2 Machine Tool Accessories - 619.1.1 Pipe Accessories - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Rotational_Speed 4.50e+01RPM
DOI: 10.3787/j.issn.1000-0976.2020.09.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

83. Design and plugging property of composite pressure activated sealant

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Title of translation:
Authors: Xu, Lin (1); Jiang, Mengchen (1); Xu, Jie (2); Xu, Mingbiao (3); Meng, Shuang (3); Wang, Dongxu (1)
Author affiliation: (1) College of Petrochemical and Energetic Engineering, Zhejiang Ocean University, Zhoushan; Zhejiang; 316022, China; (2) Institute of Exploration Techniques, Chinese Academy of Geological Sciences, Langfang; Hebei; 065000, China; (3) College of Petroleum Engineering, Yangtze University, Wuhan; Hubei; 430100, China
Corresponding author: Xu, Mingbiao(xmb62@163.com)
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Language: Chinese
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Pressure activated sealant (PAS), as a novel kind of sealing fluid, can provide rapid and self-adapting repair on the tiny damage of static seals (e.g., screws and pipelines) while encountering pressure difference of leakage sites, but its sealing property is affected more by the size of leakage site, so it exhibits limited application in the production and wellbore integrity recovery of oil & gas wells. To extend PAS's applicability, this paper put forward a composite PAS technology involving the cooperativity of solid and liquid sealing materials for enhancing large pore plugging based on the phase state transition and sealing behaviors of sealing fluid under the action of pressure difference. In this technology, two types of solid sealing materials (bridging rigid particle and tension reinforcing fiber) were used jointly to modify the geometries of leakage pores and the migration paths of fluids, which can promote the formation of effective solid barrier from the PAS to fill in large leaking pores, so as to perform sealing repair. And the following laboratory experimental results were obtained. First, the newly prepared PAS is a kind of polydisperse system, and the core particles are regular in shape with the size distribution mainly in a range of 300-400 μm. Second, in the range of evaluation pressure, sepiolite fiber, as the structure promoter, reinforces the integrity of sealing solids. Third, mussel powder, as the pore structure modifer, improves the retention ability of the sealing fluid in the limited leakage space. These two sealing materials not only cooperatively improve the structure of solid barrier, but also markedly enhance the plugging effect of composite PAS in large pores. In conclusion, these research results can provide theoretical and technical support for the development and application of novel multifunctional sealants in oil & gas wells. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 25
Main heading: Seals
Controlled terms: Leakage (fluid) - Natural gas well production - Natural gas wells - Oil field development - Oil well production - Oil wells - Pore structure - Repair - Sealants
Uncontrolled terms: Development and applications - Polydisperse systems - Pressure differences - Pressure-activated sealants - Reinforcing fibers - Research results - Retention ability - Technical support
Classification code: 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 619.1.1 Pipe Accessories - 913.5 Maintenance - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.03.013
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

84. Key technologies for the exploration and development of deep fractured-vuggy carbonate condensate gas reservoirs: A case study of the Tazhong I Gas Field in the Tarim Basin

Accession number: 20201208317974
Title of translation: -
Authors: Yang, Haijun (1); Li, Shiyin (1); Deng, Xingliang (1); Yin, Guoqing (1); Zhang, Chengsen (1); Yang, Fengying (1)
Author affiliation: (1) Research Institute of Exploration and Development, PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
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Publication year: 2020
Pages: 83-89
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to achieve large-scale efficient development of deep fractured-vuggy carbonate condensate gas reservoirs, this paper took the Tazhong I Gas Field in the Tarim Basin as an example to analyze the development difficulties of deep fractured-vuggy carbonate condensate gas reservoirs based on its exploration and development practice. Then, the special exploration and development technologies with fine description of fractured-vuggy reservoir and optimized deployment of well location as the core were summarized and analyzed. And the following research results were obtained. First, the spatial distribution of fractured-vuggy reservoirs is irregular and the reservoir is of strong heterogeneity and great burial depth, which makes it difficult to describe the reservoir precisely. What's more, as the development of condensate gas reservoirs continues, the phenomenon of retrograde condensation occurs in reservoir fluids. Due to the complexity of its reservoir space type, it is difficult to describe the occurrence state of condensate oil. The superimposed effect of these two factors makes it difficult to deploy well location optimally. Second, the three-dimensional seismic acquisition technology with "broad band, wide azimuth and high density" as the core can greatly improve the signal-to-noise ratio, resolution, and imaging accuracy of seismic data and identify the small-scale reservoirs which cannot be identified using conventional seismic acquisition technologies. Third, the fracture-vug body description technology with seismic data as the core can show the spatial distribution and development situations of fractures and vugs and realize a systematic research of a single fracture-vug body, fracture-vug unit and fracture-vug belt, laying a foundation for reserves calculation and well deployment. Fourth, the fracture-vug body and fluid identification technology with imaging logging as the core can accurately identify the fracture-vug bodies and fluids around deep carbonate wells, with a coincidence rate of interpretation result as high as 87%. Fifth, the well deployment optimization technology with the horizontal well pattern as the core can improve reservoir drilling rate and drilling success rate. And in the meantime, the trajectory of horizontal well is deployed in the middle-lower part of fracture-vug body, which can improve the primary oil and gas recovery factor greatly. Sixth, the well trajectory design optimization technology with geomechanics as the core can realize the smooth drilling and targeting of horizontal wells. It is concluded that the achieved research results provide powerful support for the efficient development of the Tazhong I Gas Field and can provide useful reference for the development of deep fractured-vuggy carbonate condensate gas reservoirs at home and abroad.
Number of references: 15
Main heading: Gas condensates
Controlled terms: Carbonation - Fracture - Gases - Geophysical prospecting - Horizontal wells - Infill drilling - Oil well logging - Petroleum prospecting - Petroleum reservoirs - Seismic response - Seismic waves - Signal to noise ratio - Spatial distribution - Technology transfer
Uncontrolled terms: Carbonate rock - Condensate gas reservoirs - Deep layer - Fractured-vuggy reservoirs - Gas fields - Gas reservoir development - Tarim Basin
Classification code: 481.4 Geophysical Prospecting - 484 Seismology - 484.2 Secondary Earthquake Effects - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 716.1 Information Theory and Signal Processing - 802.2 Chemical Reactions - 921 Mathematics - 951 Materials Science
Numerical data indexing: Percentage 8.70e+01%

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85. Reserves grading classification and development countermeasures for low-permeability tight gas reservoirs in the Ordos Basin

Accession number: 20201708556850
Title of translation: -
Authors: Cheng, Lihua (1); Guo, Zhi (1); Meng, Dewei (1); Ji, Guang (1); Wang, Guoting (1); Cheng, Minhua (1); Zhao, Xin (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China
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Publication year: 2020
Pages: 65-73
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Low-permeability tight gas reservoirs in the Ordos Basin are characterized by poor reservoir physical properties, strong heterogeneity, low reserves producing degree and large difference in reserves producing degree, so even though their reserves scale is large, it is still a big challenge to keep long-term stable production and efficient development. To this end, this paper took five main gas fields in the Ordos Basin as the research objects to carry out reserves evaluation unit classification, reserves grading classification and evaluation and reserves developmental sequence establishment on low-permeability tight gas reservoirs by taking the benefit development as the orientation and the internal rate of return (IRR) as the key evaluation index, combined with dynamic and static characteristics. Furthermore, development technical countermeasures were put forward correspondingly for each type of reserves. And the following research results were obtained. First, the Ordos Basin is low in single-well dynamic reserves and gas production rate, and its gas producing patterns can be classified into two types, i.e., multiple-layer cooperative gas supply and single-layer main gas supply. Second, the five main gas fields in the Ordos Basin are divided into 11 reserves evaluation units, based on the similarity principle of geological conditions and single-well dynamic characteristics, combined with the distribution situations of development management blocks. And then by taking IRR of 30%, 8% and 5% as the boundaries, the 11 reserves evaluation units are classified into four reserves types, including high-efficiency, efficiency, low-efficiency and difficult-to-produce. Third, with IRR 8% as the threshold of effective development, the corresponding estimated ultimate reserve (EUR) per well is compared with the actual EUR per well of each reserves evaluation unit. And according to the benefit order from the top to the bottom, the cost-effective developmental sequence of the reserves evaluation units is built up. Fourth, it is suitable to apply pressurized exploitation and local well pattern adjustment to high-efficiency reserves, well pattern infilling to middle-efficiency reserves to increase the reserve producing degree, enrichment region selection and progressive development to low-efficiency reserves, and intensive technological research to difficult-to-produce reserves to realize benefit development. In conclusion, the research results are conducive to improving the producing degree of natural gas reserves in the Ordos Basin and provide technical support for the preparation of the Ordos Basin's long-term natural gas development strategy.
Number of references: 19
Main heading: Low permeability reservoirs
Controlled terms: Cost effectiveness - Earnings - Efficiency - Gas industry - Gas permeability - Gas supply - Gases - Grading - Metamorphic rocks - Petroleum reservoir evaluation - Proven reserves - Tight gas
Uncontrolled terms: Classification and evaluations - Development countermeasures - Dynamic characteristics - Internal rate of return - Natural gas development - Reservoir physical property - Technical countermeasures - Technological researches
Classification code: 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 911.2 Industrial Economics - 913.1 Production Engineering - 931.2 Physical Properties of Gases, Liquids and Solids

Numerical data indexing: Percentage 3.00e+01%, Percentage 5.00e+00%, Percentage 8.00e+00%
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86. Is there Carboniferous-Devonian strata in the central area of western Sichuan Basin? -- Inference on the geological properties of an unconformity

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Title of translation: —?—
Authors: Liu, Shu (1); Wang, Hao (1); Lyu, Qibiao (1); Dong, Xia (1); Liu, Hong'ai (1); Sun, Wei (2)
Author affiliation: (1) Sinopec Southwest Oil & Gas Company, Chengdu; 610200, China; (2) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu; 610059, China
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Devonian in the West Sichuan Depression of the Sichuan Basin has the conditions for the formation of large oil and gas reservoirs. Due to its great burial depth and low research degree, however, its distribution situation has been suspected for a long time. Recently, an angular unconformity is newly discovered between the Permian bottom and the Cambrian bottom in the central area of West Sichuan Depression, but its geological properties cannot be defined directly due to limited data. In this paper, the geological properties of this newly discovered angular unconformity were analyzed and inferred based on the data of surface outcrop, drilling, regional tectonic evolution, distribution of Devonian-Carboniferous residual strata in the northern area of the West Sichuan Depression and sedimentary facies. Then, this unconformity was compared and traced in detail, the distribution of the Devonian-Carboniferous residual strata was studied, and the Pre-Permian paleogeological map was prepared. Finally, the formation mechanism of rift trough was discussed based on the evolution history of Qinqi ocean in the Caledonian period. What's more, the oil and gas exploration prospect of Devonian-Carboniferous in this area was predicted based on the seismic facies characteristics of reef flat. And the following research results were obtained. First, this unconformity may be the bottom boundary of the Devonian, and it is overlain by the Devonian-Carboniferous residual strata. It is mainly distributed in the Wenxing-Zhongjiang-Mianyang-Laoguanmiao area. Second, the Devonian-Carboniferous residual strata present the characteristics of rift trough, and there are many rifts. Third, the rift trough may be the extension of Qinqi ocean during the Ordovician-Carboniferous and evolves into the secondary rift in Longmenshan rift valley. Fourth, with the West Sichuan rift trough as the center, the Devonian-Carboniferous reef flat facies is symmetrically distributed on both sides. The scale is large and the characteristics of reef flat facies are obvious. In conclusion, reef flat facies is developed in the Devonian-Carboniferous of West Sichuan Depression, which is overlain by the Permian reef flat facies and underlain by the Cambrian hydrocarbon generating center, so it has favorable conditions for multi-layer 3D exploration and good prospect of oil and gas exploration. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 24
Main heading: Offshore petroleum prospecting
Controlled terms: Angular distribution - Geological surveys - Geology - Offshore gas fields - Petroleum reservoir engineering - Petroleum reservoirs - Reefs
Uncontrolled terms: Angular unconformity - Favorable conditions - Formation mechanism - Geological properties - Oil and gas exploration - Oil and gas reservoir - West Sichuan depression - Western Sichuan basin
Classification code: 481.1 Geology - 512 Petroleum and Related Deposits
DOI: 10.3787/j.issn.1000-0976.2020.09.001
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

87. Key areas and enterprise countermeasures of the natural gas price reform during the 14th Five-Year Plan Period

Accession number: 20210309770790
Title of translation: ""
Authors: Fu, Shu (1); Zhang, Pengcheng (2); Dong, Zhenyu (3); Dong, Cong (4)
Author affiliation: (1) Beijing University of Technology, Beijing; 100124, China; (2) CNPC Economic & Technology Research Institute, Beijing; 100724, China; (3) PetroChina Finance Department, Beijing; 100007, China; (4) University of international business and Economics, Beijing; 100029, China
Corresponding author: Zhang, Pengcheng(zpc.syb@cnpc.com.cn)
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Pages: 159-167
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Natural gas industry in China is now facing new situation and new requirements during the period of 14th Five-Year Plan, which not only provides new opportunities for natural gas pricing reform, but brings about new challenges for all the participators involved in each link of the industrial chain. In order to accurately grasp the development direction and continuously push forward the market-oriented reform of natural gas price, we analyzed the major existing problems such as the hindrance of gate station price control, the imperfect current market situation, and the seriously insufficient price discovery ability of trading center, and so on. Then, we put forward some key contents of China's natural gas price reform and the countermeasures of the upstream, middle and downstream enterprises in the industrial chain. Restricted by high concentration of upstream supply, undeveloped infrastructure, and the lack of market-oriented benchmark price, the 14th Five-Year Plan period will be still the transitional stage of China's natural gas price marketization so that the reform should focus on the following aspects. (1) To cancel gate price control in batches according to market competition conditions; (2) To reasonably determine the charging price of natural gas infrastructure such as pipeline, underground gas storage, LNG terminal, and implement two-part pricing; (3) To use price design and policy stimulus to accelerate the construction of natural gas infrastructure; (4) To guide enterprises to realize price marketization by signing long-term contracts; (5) To cultivate multiple natural gas trading hubs and find representative benchmark prices from them; (6) Enterprises in the upper, middle and lower reaches of the industrial chain should deeply understand the new requirements of the state for the development of the industry, comply with the general direction of natural gas price reform and improve market-oriented operation ability, make efforts to reduce costs, increase efficiency and service innovation, and actively respond to changes and promote reform.
Number of references: 19
Main heading: Costs
Controlled terms: Commerce - Competition - Gas industry - Infrastructure as a service (IaaS) - Liquefied natural gas - Service industry - Storage as a service (STaaS) - Underground gas storage
Uncontrolled terms: Development directions - Long-term contracts - Market competition - Market oriented reforms - Natural gas infrastructure - Natural gas pricing - Natural gas trading - Service innovation
Classification code: 522 Gas Fuels - 523 Liquid Fuels - 722.4 Digital Computers and Systems - 911 Cost and Value Engineering; Industrial Economics - 911.2 Industrial Economics
DOI: 10.3787/j.issn.1000-0976.2020.12.018
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

88. Charging simulation experiment and characteristics of tight sandstone gas reservoirs: A case study of the Upper Triassic Xujiahe Formation sandstone gas reservoir in the central Sichuan Basin

Accession number: 20205209693553
Title of translation: -
Authors: Xie, Zengye (1, 2); Yang, Chunlong (1, 2); Li, Jian (1, 2); Jin, Hui (1, 2); Wang, Xiaojuan (3); Hao, Cuiguo (1, 2); Zhang, Lu (1, 2); Guo, Jianying (1, 2); Hao, Aisheng (1, 2)
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Corresponding author: Yang, Chunlong(clyang1989@163.com)
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Publication year: 2020
Pages: 31-40
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Tight sandstone gas reservoir has small pore throat, complex pore structure and high water saturation with the main controlling factors unknown, which makes it difficult to investigate the large-scale hydrocarbon accumulation mechanism of gas reservoir and predict gas and water distribution. By taking the tight sandstone gas reservoir of Upper Triassic Xujiahe Formation in the central Sichuan Basin as the research object, on-line dynamic simulation was carried out on gas-driving-water process in tight sandstone under different displacement pressures using the simulation experimental equipment based on the organic combination of low-field NMR and high-pressure displacement device. Then, the occurrence and flow characteristics of gas and water in rocks under different pressures were investigated, and the relationships between fluid saturation and charging pressure and pore diameter were characterized quantitatively. Finally, the enrichment mechanisms of tight sandstone gas were discussed. And the following research results were obtained. First, the main reservoir body controlling the gas saturation of Xujiahe Formation gas reservoir is the reservoir space with a pore diameter of 0.1-10.0 μm. Second, on the whole, gas saturation presents an increasing trend with the increase of porosity and permeability. When porosity and permeability are similar, gas saturation is mainly controlled by reservoir space with a pore diameter larger than 1.0 μm. And the larger the proportion of large pore diameter, the higher the gas saturation. Third, the gas saturation of the Xujiahe Formation tight sandstone reaches 70% of the total value under a charging pressure of 3.0-5.5 MPa and then it increases slowly and the total increase is small with the increase of the charging pressure. Fourth, "coupling of small differential pressure drive and reservoir space with relatively large pore diameter" is an important factor for the formation of large- and medium-sized gas fields with high water saturation in the tight sandstone of low gas generation intensity region. In conclusion, due to the characteristics of "small pore diameter, low gas generation intensity and proximal accumulation", the Xujiahe Formation reservoir in the central Sichuan Basin is mainly driven by small pressure difference and has the reservoir space with relatively large pore diameters. Natural gas can be enriched and accumulated into reservoirs on a large scale, but the reservoir has high water saturation.
Number of references: 35
Main heading: Oil field equipment
Controlled terms: Gas generators - Gas permeability - Gases - Petroleum reservoir engineering - Petroleum reservoirs - Pore structure - Porosity - Sandstone - Tight gas - Water supply systems
Uncontrolled terms: Central Sichuan Basin - Differential pressures - Displacement pressure - Experimental equipments - Flow charac-teristics - Hydrocarbon accumulation - Main controlling factors - Pressure differences
Classification code: 446.1 Water Supply Systems - 482.2 Minerals - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Percentage 7.00e+01%, Pressure 3.00e+06Pa to 5.50e+06Pa, Size 1.00e-06m, Size 1.00e-07m to 1.00e-05m
DOI: 10.3787/j.issn.1000-0976.2020.11.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

89. A method for evaluating the flushing efficiency of cementing preflush: An improved rotary viscometer method

Accession number: 20205209694911
Title of translation: -
Authors: Gu, Tao (1, 2); Zheng, Youcheng (3); Zheng, Youzhi (1, 4); Li, Wei (3); Zhao, Jun (1); Wang, Rui (1); Shu, Qiugui (5)
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Corresponding author: Zheng, Youcheng(zheng_ych@petrochina.com.cn)
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Pages: 120-126
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Flushing efficiency is a key index to evaluate the performance of cementing preflush, and it has direct influence on the optimization, dosage and displacement design of preflush and eventually impacts the cementing quality. Aiming at the shortcomings of the traditional rotary viscometer method in evaluating the flushing efficiency of preflush, such as large error and poor repeatability, this paper improves rotary drum's structure and residual drilling fluidmass determination method. Then, the effectiveness and applicability of the improvement measures are analyzed experimentally. Finally, the improved evaluation method is applied to select the oil-washing agent and optimize the flushing time of cementing preflush in the shale gas horizontal well of Wellblock Y. And the following research results were obtained. First, by virtue of the improved method, the influence that the inner wall of the rotary drum cannot be effectively washed and there is residual washing fluid or clear water on the rotary drum can be avoided, so the accuracy and repeatability of the experimental results are greatly improved. The standard deviation of the results of multiple parallel experiments is within 3%. Second, the improvement of accuracy and repeatability makes the experimental results under different experimental conditions comparable. Third, for the cementing of the shale-gas horizontal well in Wellblock Y, oil-washing agent S80 is the highest in flushing efficiency, and flushing efficiency and economy are higher when the preflush volume is designed based on the flushing time of 8-10 min. In conclusion, the improved rotary viscosimeter method can accurately evaluate the flushing efficiency of preflush and provide a basis for the selection of preflush and the optimization of application technological parameters.
Number of references: 23
Main heading: Horizontal wells
Controlled terms: Cementing (shafts) - Efficiency - Petroleum reservoir evaluation - Quality control - Shale gas - Viscometers - Viscosity measurement - Washing
Uncontrolled terms: Accuracy and repeatabilities - Determination methods - Displacement design - Efficiency and economies - Experimental conditions - Improvement measure - Standard deviation - Technological parameters
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 913.1 Production Engineering - 913.3 Quality Assurance and Control - 943.3 Special Purpose Instruments
Numerical data indexing: Percentage 3.00e+00%, Time 4.80e+02s to 6.00e+02s
DOI: 10.3787/j.issn.1000-0976.2020.11.014
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

90. Challenges of the mechanical properties of permafrost in frigid sea areas to oil and gas drilling

Accession number: 20205209694926
Title of translation:
Authors: Zhu, Liang (1, 2, 3); Fan, Xizhe (4); Li, Junwei (4); Zou, Hejun (5); Lou, Yishan (1, 2, 3); Li, Zhonghui (1, 2, 3)
Author affiliation: (1) Circulation Loss Control Technology Research Department, National Engineering Laboratory of Oil & Gas Well Drilling Technology, Yangtze University, Wuhan; 430100, China; (2) Key Laboratory of Drilling and Production Engineering for Oil and Gas, Yangtze University, Wuhan; 430100, China; (3) Petroleum Engineering College, Yangtze University, Wuhan; 430100, China; (4) CNOOC Services Limited, Tianjin; 300459, China; (5) Engineering Technology Department, CNPC Xibu Drilling Engineering Co., Ltd., Urumqi; 830011, China
Corresponding author: Lou, Yishan(louys2006@126.com)
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Publication year: 2020
Pages: 110-119
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: At present, global offshore oil & gas exploration and development activities are mainly distributed in tropical zones and temperate zones. With the change of worldwide energy development pattern and the continuous increase of oil and gas demand, however, oil and gas resources in frigid sea areas get more and more concerns and attentions. The particular mechanical properties of permafrost bring great difficulties and challenges to oil and gas production in frigid sea areas. At present, there are few domestic reports on drilling technology used in the frigid sea areas. By investigating domestic and foreign literatures, this paper analyzes the mechanical characteristics of permafrost under different states, as well as its risks in terms of wellbore safety, drilling platform, drilling fluid system, cementing and natural gas hydrate. Then, the status of key process and its supporting technologies for well drilling in permafrost are illustrated comprehensively, including casing insulation, optimized fast drilling, low-temperature drilling fluid, low-temperature cementing and drilling platform design. And the following research results were obtained. First, the mechanical properties of permafrost are more sensitive to its environmental temperature, which is the key factor for stabilizing the mechanical properties of permafrost and realizing safe and fast drilling. Second, the core technologies to ensure smooth drilling in offshore permafrost include reasonable and efficient thermal insulation technology, low-temperature fluid technology and anti-ice drilling platform technology. In conclusion, there are abundant oil and gas resources in frigid sea areas. In order to improve the competitiveness of China's offshore drilling technologies in the world, it is of great significance to develop and master the related drilling technologies used in the frigid sea areas after clarifying the distribution characteristics and mechanical properties of permafrost.
Number of references: 52
Main heading: Offshore oil wells
Controlled terms: Cementing (shafts) - Drilling fluids - Drilling platforms - Energy resources - Gas hydrates - Gas industry - Gases - Infill drilling - Mechanical properties - Natural gas wells - Natural resources exploration - Offshore drilling - Offshore gas fields - Offshore oil well production - Offshore technology - Permafrost - Petroleum industry - Temperature - Thermal insulation - Tropics - Well drilling
Uncontrolled terms: Distribution characteristics - Drilling fluid systems - Environmental temperature - Insulation technology - Mechanical characteristics - Oil and gas production - Platform technology - Supporting technology
Classification code: 413.2 Heat Insulating Materials - 443 Meteorology - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 641.1 Thermodynamics - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.11.013
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

91. Integrated geosteering technology for CQ-IGS horizontal wells and its application in the Changning-Weiyuan National Shale Gas Demonstration Area

Accession number: 20202508844939

Title of translation: CQ-IGS--
Authors: Shi, Jingsuicui (1); He, Ying (1); Wu, Zongwei (1); Wang, Hao (1); Chen, Ming (1); Fu, Jinxiang (1); Liao, Qiming (1); Liu, Ming (1); Hong, Bing (2)
Author affiliation: (1) Geological Exploration & Development Research Institute, CNPC Chuanqing Drilling Engineering Co. Ltd., Chengdu; Sichuan; 610051, China; (2) Chengdu Chuandachuanke Network Information Co. Ltd., Chengdu; Sichuan; 610041, China
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Publication year: 2020
Pages: 43-49
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Geosteering technique is one of the core technologies in the drilling of shale-gas horizontal wells, but the conventional method only based on logging while drilling data cannot meet the needs of rapid commercial development of shale gas. To control the trajectory of horizontal wells accurately, this paper established a fine 3D geosteering model using the high-resolution 3D seismic data volume processing technique, combined with the independently developed Chuanqing-Integrated Geo-Steering (CQ-IGS) software platform. In this software platform, integrated processing and interpretation was carried out on 3D seismic, logging while drilling and compound mud logging. The horizontal well trajectory was controlled accurately by means of cuttings identification and component analysis technique. In this way, a horizontal well integrated geosteering technique was developed. Its application in 187 wells in the Changning-Weiyuan National Shale Gas Demonstration Area of the Sichuan Basin during 2011-2018 shows that the drilling time of the horizontal section of each horizontal well is shortened from 35 d to 25 d in 2018; the average target drilling rate per well is 96.7%; the average optimal geological sweet spot drilling rate per well is increased from 35.3% in 2014 to 91.0% in 2018; the average daily production per well is increased from 11.5×104 m3 to 15.5×104 m3 in the Weiyuan Shale Gas Block and from 14.0×104 m3 to 18.5×104 m3 in the Changning Shale Gas Block. In conclusion, this technique reasonably optimizes drilling trajectory, shortens drilling cycle, reduces drilling cost, and remarkably improves target-encountered drilling rate and single-well production rate. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 16
Main heading: Logging while drilling
Controlled terms: 3D modeling - Data handling - Gases - Horizontal wells - Infill drilling - Mud logging - Seismology - Shale gas - Trajectories
Uncontrolled terms: Commercial development - Component analysis - Conventional methods - Daily production - Horizontal section - ITS applications - Single well production - Software platforms
Classification code: 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 723.2 Data Processing and Image Processing
Numerical data indexing: Percentage 2.01e+03% to 9.10e+01%, Percentage 3.53e+01%
DOI: 10.3787/j.issn.1000-0976.2020.05.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

92. Seepage mechanism and development characteristics of high and ultra-high pressure carbonate gas reservoirs: A case study from the M Block of the Amu Darya Basin

Accession number: 20201708556855
Title of translation: ---M
Authors: Zhang, Li (1); Liu, Ronghe (1); Leng, Youheng (2); Cai, Kunchi (1); Gao, Yijun (1); Meng, Zhonghua (1); Liu, Yuanyuan (3)
Author affiliation: (1) Geology Exploration and Development Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China; (2) PetroChina - Turkmenistan Amu Darya River Gas

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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 92-98
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to understand the root causes that affect the production performance of high and ultra-high pressure gas wells, this paper selected multiple cores from the carbonate gas reservoirs in the M Block of the Amu Darya Basin, Turkmenistan to carry out multi-round stress sensitivity experiments under variable confining pressure, depletion development experiments, CT scanning experiments and three-dimensional digital core simulation experiments. Then, the production characteristics of high and ultra-high pressure gas wells were analyzed in detail, and the effects of fractures of different occurrences and their development degrees on gas well productivity were studied. Finally, reasonable development countermeasures for the high and ultra-high pressure gas reservoirs in the carbonate gas field of the M Block in the early development stage were put forward. And the following research results were obtained. First, stress sensitivity experiments show that the stress sensitivity of porous and vuggy cores is moderately weak and that of fractured-porous cores is strong. In addition, the irreversible permeability damage rate is high and mainly concentrated in the initial stage of pressurization. Second, the elastic expansion of rocks is the main drive energy in the early exploitation stage of high and ultra-high pressure gas reservoirs. Third, as for high and ultra-high pressure gas reservoirs, it is necessary to control the gas production rate in the early stage of development, which is beneficial to reduce the decline amplitude of gas well productivity and increase the intermediate degree of reserve recovery. Fourth, the initial productivity of the gas wells in fractured-porous reservoirs is mainly affected by the fracture development degree, and the decline amplitude of gas well productivity is mainly dominated by the fracture occurrence. Fifth, for the reservoirs dominated by the low-angle fractures, after the formation pressure drops, the fractures get closed easily and the gas well productivity decreases rapidly. Therefore, the production pressure difference shall be strictly controlled in the early stage of development. Sixth, before the formation pressure drops to 45 MPa, it is necessary to keep the production pressure difference of most gas wells in the high and ultra-high pressure gas reservoirs of the Amu Darya Basin less than 5 MPa. It is concluded that the newly established method has certain generality and can provide reference for the optimal development of high and ultra-high pressure gas reservoirs in the other regions.
Number of references: 20
Main heading: High pressure effects
Controlled terms: Carbonation - Computerized tomography - Drops - Fracture - Gas industry - Gases - Hydrocarbon seepage - Natural gas well production - Natural gas wells - Oil field development - Petroleum reservoirs - Pressure drop - Productivity - Proven reserves
Uncontrolled terms: Development characteristics - Development countermeasures - Fractured-porous reservoirs - Production characteristics - Production pressure differences - Ultra - high pressure gas wells - Ultra-high pressure gas reservoir - Variable confining pressures
Classification code: 512 Petroleum and Related Deposits - 522 Gas Fuels - 723.5 Computer Applications - 802.2 Chemical Reactions - 951 Materials Science
Numerical data indexing: Pressure 4.50e+07Pa, Pressure 5.00e+06Pa
DOI: 10.3787/j.issn.1000-0976.2020.03.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

93. Optimization of GRI porosity determination method for marine shale

Accession number: 20210109725860
Title of translation: GRI
Authors: Fu, Yonghong (1, 2); Jiang, Yuqiang (1, 2); Xia, Guoyong (3); Chen, Hu (3); Zhou, Keming (4); Wang, Jin (3); Wang, Zimeng (1); Wang, Zhanlei (1, 2); Yin, Xingping (1); Gu, Yifan (1, 2)

Author affiliation: (1) School of Geosciences and Technology, Southwest Petroleum University, Chengdu; 610500, China; (2) Reservoir Evaluation Laboratory, CNPC Key Laboratory of Unconventional Oil and Gas, Chengdu; 610500, China; (3) Development Department, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China; (4) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610213, China
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Publication year: 2020
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Porosity is one of the most basic parameters in the study of shale gas reservoirs. GRI (Gas Research Institute) method is usually adopted to determine the total shale porosity, but it cannot determine the total sample volume accurately and lacks technical specifications on drying temperature, crushed particle size, saturation pressure and equilibrium time. In this paper, the marine shale of Lower Silurian Longmaxi Formation in the Rongchang area of the Sichuan Basin was taken as the research object to solve the above mentioned problems. The Geopyc 1360 volumetric analyzer and Accupyc1340 solid densitometer of material science were introduced jointly to determine total shale porosity. In addition, the influences of sample factors (e.g. drying temperature, crushed particle size, oil washing, saturation pressure and equilibrium time) on the determination result of shale porosity were discussed. And the following experimental results were obtained. First, the optimal drying temperature to determine the porosity of shale samples is 110. If the temperature is too high, the shale pore structure may be changed. Second, the optimal particle size for porosity determination is 10.00-0.25 mm. If the particle size is too small, shale's skeleton structure may be destroyed. Third, no oil washing is needed in the samples of high-maturity shale for porosity determination. Fourth, the optimal saturation pressure is in the range of 0.66-1.03 MPa and the equilibrium time is no less than 10 min. It is concluded that by optimizing the GRI porosity determination method, the bulk volume of irregular shale sample can be determined, and the pretreatment conditions and test parameters suitable for determining the porosity of marine shale are provided. The optimized method can save the drilling cost of plug sample, shorten the determination time and meet the experimental requirements of shale gas exploration and development.
Number of references: 45
Main heading: Porosity
Controlled terms: Drying - Geological surveys - Meteorological instruments - Particle size - Petroleum prospecting - Petroleum reservoirs - Pore structure - Shale gas - Washing
Uncontrolled terms: Determination methods - Drying temperature - Experimental requirements - Optimal particle sizes - Pretreatment conditions - Saturation pressure - Shale gas reservoirs - Technical specifications
Classification code: 443.2 Meteorological Instrumentation - 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Pressure 6.60e+05Pa to 1.03e+06Pa, Size 1.00e-02m to 2.50e-04m, Time 6.00e+02s
DOI: 10.3787/j.issn.1000-0976.2020.10.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

94. Integrity analysis method of multi-packer string in HTHP gas wells and its application cases

Accession number: 20203509114470
Title of translation:
Authors: Liu, Hongtao (1); Shen, Xinpu (2); Liu, Shuang (1); Shen, Guoyang (2); Qin, Shiyong (1); Shen, Guoxiao (2)
Author affiliation: (1) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China; (2) China University of Petroleum-East China, Qingdao; Shandong; 266580, China
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Publication year: 2020
Pages: 83-89
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to analyze and calculate the mechanical behavior of multi-packer string and to evaluate the integrity of packer, this paper took the integrity of a double-packer string system under the loading conditions of fracturing construction as the research object to advance a comprehensive analysis method which combines the full-length string mechanics analysis with the 3D finite element analysis of packer's mandrel. In addition, the related analysis and calculation workflow was provided. A case study was carried out on the elastoplastic mechanics of Well Dixi 1 in the Tarim Basin. Firstly, 3D finite element analysis was performed on the entire pipe string in the full length to figure out the stress distribution along the pipe string. Then, 3D solid element was used to analyze stress distribution and elastoplastic strain distribution in the local structure of packer's mandrel to determine the operation safety of double-packer pipe string. And the following research results were obtained. First, under the action of gravity, hydraulic pressure and temperature stress, the axial stress on each part of the string is tensile stress, which is in the scope of elastic stress. Second, under the joint action of axial stress and hydraulic pressure, the mandrel suffers obvious plastic deformation. Third, in order to alleviate the excessive axial tensile stress induced by the temperature drop caused by fracturing construction, an expansion joint shall be installed between two packers. In conclusion, the numerical results of the deformation and stress distribution of multi-packer string calculated by this method are well accordant with the actual situations, which verifies the effectiveness and practicability of this method.
Number of references: 17
Main heading: Finite element method
Controlled terms: Elastoplasticity - Hydraulic fluids - Numerical methods - Packers - Stress concentration - Tensile stress
Uncontrolled terms: 3D-finite element analysis - Analysis and calculations - Comprehensive analysis methods - Deformation and stress - Elastoplastic strain - Fracturing construction - Hydraulic pressure - Mechanical behavior
Classification code: 511.2 Oil Field Equipment - 921.6 Numerical Methods
DOI: 10.3787/j.issn.1000-0976.2020.07.010
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

95. A material balance based practical analysis method to improve the dynamic reserve evaluation reliability of ultra-deep gas reservoirs with ultra-high pressure

Accession number: 20203509114444
Title of translation: -
Authors: Sun, Hedong (1); Cao, Wen (1); Li, Jun (1); Jia, Wei (2); Li, Yuanjie (2); Wu, Yan (2); Zhu, Songbai (2); Fu, Xiaotao (2); Yang, Min (2); Meng, Guangren (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency
Abstract: Ultra-deep major gas fields are typically characterized by high and ultra-high pressure, tight matrix and developed fractures, so the dynamic reserve estimation is of higher uncertainty. In order to accurately estimate the dynamic reserves of this type of gas reservoir, this paper analyzed the correlation between the effective rock compressibility and the cumulative effective rock compressibility based on the material balance equation of high and ultra-high pressure gas reservoirs, and accordingly selected the material balance based analysis method suitable for the dynamic reserves estimation of high and ultra-high pressure gas reservoirs. Then, the starting calculation conditions of dynamic reserve estimation were determined using the non-linear regression method. In addition, a semi-logarithmic type curve matching method was established for the cases where the starting conditions could not be met. Finally, this method was applied to calculate the dynamic reserves of three ultra-high pressure gas fields (reservoirs) to verify its reliability. And the following research results were obtained. First, the cumulative effective compressibility of gas reservoir in the material balance equation of high and ultra-high pressure gas reservoir is a key parameter influencing its dynamic reserves, and it is the function of original formation pressure and current average formation pressure, but its numerical value can be hardly obtained by core experiments. Second, it is recommended to adopt the nonlinear regression method without compressibility to estimate the reserves of high and ultra-high pressure gas reservoirs. Third, the calculation starting point of dynamic reserves by the nonlinear regression method (the starting point of dimensionless apparent formation pressure-cumulative gas production curve deviating from the straight line relationship) cannot be theoretically calculated. The calculation starting point for different dimensionless linear coefficients (#D) obtained from the statistical results by the graphic method corresponds to the dimensionless apparent pressure depletion degree of 0.06-0.38, and that obtained based on the data statistics of the example gas reservoir falls within this interval. Fourth, when the starting conditions are not satisfied, the semi-logarithmic type curve matching method can be used for reserve estimation. The ratio of the dynamic reserves to the apparent geological reserves G/Gapp is a function of#D. The higher the#D, the lower the G/Gapp. Fifth, for the high and ultra-high pressure gas reservoirs in the production test stage, the test production time shall be extended as long as possible to improve the reliability of dynamic reserve estimation. And for those in the middle and late stages of development, it is necessary to prepare the comprehensive treatment measures on the basis of dynamic reserves so as to improve the development effects of gas reservoirs continuously. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 23
Main heading: Proven reserves
Controlled terms: Compressibility of gases - Curve fitting - Gas industry - Gases - Graphic methods - High pressure engineering - Petroleum reservoir evaluation - Petroleum reservoirs - Regression analysis - Reliability analysis
Uncontrolled terms: Cumulative gas productions - Geological reserves - Linear coefficients - Material balance equation - Non-linear regression method - Reserves estimations - Rock compressibility - Ultra-high pressure gas reservoir
Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 921.6 Numerical Methods - 922.2 Mathematical Statistics - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.07.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

96. Application of the combination of high-pressure mercury injection and nuclear magnetic resonance to the classification and evaluation of tight sandstone reservoirs: A case study of the Linxing Block in the Ordos Basin

Accession number: 20201708556740
Title of translation: --
Authors: Kong, Xingxing (1); Xiao, Dianshi (1); Jiang, Shu (2); Lu, Shuangfang (1); Sun, Bin (1); Wang, Jingming (1)
Author affiliation: (1) School of Geosciences and Technology, China University of Petroleum - East China, Qingdao; Shandong; 266580, China; (2) Key Laboratory of Tectonic and Hydrocarbon Resource, Ministry of Education, China University of Geosciences - Wuhan, Wuhan; Hubei; 430074, China
Corresponding author: Xiao, Dianshi(xiaods@upc.edu.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Pages: 38-47
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Tight sandstone gas reservoirs have poorer porosity-permeability relationships, so conventional reservoir classification schemes can hardly satisfy the classification and evaluation demand of this type of reservoirs. To solve this problem, this paper took the Permian tight sandstone gas reservoir in the Linxing Block along the eastern margin of the Ordos Basin as an example to describe the micro-structures of the tight sandstone reservoirs by means of high-pressure mercury injection, nuclear magnetic resonance (NMR), scanning electron microscope (SEM) and so on. Then, the control effect of micro-structure parameters on the macrophysical properties was studied. Finally, classification and evaluation of tight sandstone reservoirs were carried out on this basis. And the following research results were obtained. First, NMR can identify the distribution of pores of different sizes, and high-pressure mercury injection can reflect the pore-throat configuration and percolation capacity of a reservoir. Second, both methods are better coincident in the description results. With an increase of the right peak of T2 spectra, the mercury intrusion curve presents a concave shape and the pore throat radius increases while the pore type gradually changes from intragranular dissolution pores and intercrystalline pores to intergranular pores and intergranular dissolution pores and the reservoir quality gets better. Third, micro-pore structure controls reservoir physical properties and fluid mobility. And the porosity of large pores is best correlated with the effective porosity, so it can be used to evaluate the reservoir capacity of tight sandstone. Fourth, the throat radius R15 obtained by high pressure mercury injection is in the best correlation with porosity and permeability, so it can be used to evaluate the percolation capacity of tight sandstone. Fifth, by combining the porosity of large pores with the R15, the tight sandstone reservoirs in the Linxing Block are classified into 4 categories, and the classification results are in a good agreement with the on-site well test data. It is concluded that the combination of high-pressure mercury injection and NMR can effectively identify the key parameters which reflect the reservoir capacity and percolation capacity of tight sandstone, and improve the reliability and integrity of reservoir classification. And by selecting the key parameters that reflect reservoir capacity and percolation capacity, it can provide the guidance for the classification and evaluation of tight sandstone reservoirs. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 38
Main heading: Petroleum reservoir evaluation
Controlled terms: Dissolution - Metamorphic rocks - Nuclear magnetic resonance - Petroleum reservoirs - Pore structure - Porosity - Sandstone - Scanning electron microscopy - Solvents - Textures - Tight gas - Well testing
Uncontrolled terms: Classification and evaluations - Classification results - Intercrystalline pores - Micro-structure parameters - Nuclear magnetic resonance(NMR) - Pore-throat configurations - Reservoir physical property - Tight sandstone reservoirs
Classification code: 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 802.3 Chemical Operations - 803 Chemical Agents and Basic Industrial Chemicals - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.03.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

97. A calculation model for water breakthrough time of gas wells in gas reservoirs with edge water considering the heterogeneity between reservoirs: A case study of the Lower Triassic Feixianguan gas reservoirs in the Puguang Gas Field

Accession number: 20202308799533
Title of translation: -
Authors: Li, Jiqiang (1); Yang, Shenyao (1); Qi, Zhilin (1); Zhao, Guanqun (1); Yin, Bingyi (1); Mo, Fei (1)
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Source title: Natural Gas Industry
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Pages: 69-76
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The existing models for calculating the water breakthrough time of gas wells in gas reservoirs with edge water ignore the effects of reservoir's interlayer heterogeneity, so their calculation results are more deviated from the actual water breakthrough time of gas wells. As a result, they cannot accurately and effectively guide the adjustment of gas well production system and the formulation of technical water control measures. In this paper, a water-flooding seepage experiment of parallel core was conducted by taking the gas reservoir with edge water of Lower Triassic Feixianguan Formation in the Puguang Gas Field of the Sichuan Basin as an example. Then, the effects of edge water inrush caused by the interlayer heterogeneity of reservoir on water breakthrough time of gas wells was analyzed by means of reservoir numerical simulation. Based on this, the inrush coefficient was introduced to characterize the interlayer heterogeneity of reservoir, and a model for calculating the water breakthrough time of gas wells in the commingled gas reservoir with edge water considering the influence of interlayer heterogeneity was established. Finally, five wells in the gas reservoir of Feixianguan Formation in the Puguang Gas Field were selected for case calculation. And the following research results were obtained. First, the the interlayer heterogeneity of gas reservoir results in edge water burst. And the stronger the interlayer heterogeneity, the more severe the edge water coning and the sooner the water breakthrough. The water breakthrough time of gas wells depends on the water breakthrough time in the reservoir with the highest permeability. Second, a model for calculating the water breakthrough time of gas wells in the gas reservoirs with edge water considering the influence of reservoir interlayer heterogeneity is established based on the seepage theory. And the relative errors of its calculation results is in the range of -3.43-4.70%, which can satisfy the accuracy requirement of engineering errors. In conclusion, this newly established model can provide an effective method for accurately calculating the water breakthrough time of the gas well in the commingled gas reservoir with edge water. Furthermore, it is conducive to the adjustment of the production system of gas wells in the gas reservoir with edge water and the formulation of technical water control measures.
Number of references: 22
Main heading: Hydrocarbon seepage
Controlled terms: Gas industry - Gases - Natural gas well production - Natural gas wells - Petroleum reservoir engineering - Petroleum reservoirs - Reservoirs (water) - Secondary recovery
Uncontrolled terms: Calculation models - Calculation results - Feixianguan formation - Feixianguan gas reservoirs - Production system - Puguang gas field - Reservoir numerical simulation - Water breakthrough
Classification code: 441.2 Reservoirs - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels
Numerical data indexing: Percentage -3.43e+00%
DOI: 10.3787/j.issn.1000-0976.2020.04.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

98. Structural reworking effects and new exploration discoveries of subsalt ultra-deep reservoirs in the Kelasu tectonic zone

Accession number: 20200908220938
Title of translation:
Authors: Wei, Guoqi (1); Wang, Junpeng (1, 2, 3); Zeng, Lianbo (2); Tang, Yongliang (4); Wang, Ke (1, 3); Liu, Tiantian (2); Yang, Yu (5)
Author affiliation: (1) Tarim Basin Research Center, PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) College of Geosciences, China University of Petroleum, Beijing; 102249, China; (3) PetroChina Hangzhou Institute of Geology, Hangzhou; Zhejiang; 310023, China; (4) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China; (5) No.1 Mud Logging Company, CNPC Bohai Drilling Engineering Co., Ltd., Tianjin; 300280, China
Corresponding author: Wang, Junpeng(wangjp_hz@petrochina.com.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.

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Issue date: January 25, 2020
Publication year: 2020
Pages: 20-30
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Bashijiqike Formation of Lower Cretaceous in the oil and gas group in the Kelasu tectonic zone of the Tarim Basin is deeper than 6 000 m with the characteristics of low reservoir matrix permeability, developed fractures and significant reworking effect of structure on reservoir. However, the exploration breakthrough of Well Bozi 9 reflects that the structural reworking effects in different zones vary greatly and the heterogeneity is quite strong. Therefore, recognizing the structural reworking effects on reservoirs again is of great significance in predicting ultra-deep reservoirs and guiding oil & gas exploration and production. In this paper, the structural reworking effects on the ultra-deep reservoirs in the oil and gas group of Kelasu tectonic zone and their diversity were qualitatively analyzed and quantitatively calculated using drilling coring, structural equilibrium and restoration, isotopic dating of fracture fillings and numerical simulation of block stress, combined with fluid inclusion analysis, acoustic emission paleo-stress analysis, casting slice and other experimental analysis methods. And the following research results were obtained. First, the Tianshan orogenic belt in the north and the paleo-uplift in the south dominate the sedimentary pattern and the differential tectonic deformation of reservoirs in this tectonic zone. As a result, the distribution characteristics of being "thin in the west and thick in the east" of the Bashijiqike Formation reservoir are formed. Second, in the Bozi Block, paleo-stress is the smallest, structural deformation is mainly in the form of forward compression and thrust propagation, and oblique compression and torsion occurs in local well blocks. Third, in the Dabei Block, oblique compression and torsion is dominant, paleo-stress is smaller and structural deformation is in the form of thrust stacking. And in the Keshen Block, paleo-stress is the highest and structural deformation is mainly in the form of forward compression, thrust and uplift of trailing edge, and slippage and shrinkage of leading edge. Fourth, differential tectonic deformation results in a large difference in the amount of structural reduction in the same structural belt with different structural deformation patterns. And it also controls the superimposed effects of fracture formation and diagenetic cementation in different blocks and the configuration relationship between fracture networks and oil & gas accumulation periods in the middle and late stages, and increases the reservoir heterogeneity. Therefore, the differential structural deformation is the basic reworking factor for the variation of productivity in different blocks. Fifth, the magnitude and direction of the current tectonic stress affect the fracture effectiveness. In the southern part, the compressive stress is strong, the intersection angle between the fracture direction of the higher position of the anticline and the current stress is smaller, and the fracture effectiveness is the best. Sixth, the type of structural fracture fillings is dependent on the structural diagenetic environment. In the northern block, the diagenetic environment of freshwater and semi-alkaline medium is dominant, so the type of fracture fillings is calcite, which is conducive to the acid fracturing of reservoir.
Number of references: 31
Main heading: Acoustic emission testing
Controlled terms: Calcite - Compressive stress - Deformation - Filling - Fracture - Gas industry - Low permeability reservoirs - Numerical methods - Petroleum prospecting - Petroleum reservoir engineering - Shrinkage - Stress analysis - Structural analysis - Subsalt strata - Tectonics - Torsional stress
Uncontrolled terms: Diversity - Early Cretaceous - Paleogeomorphology - Sub salts - Tarim Basin - Tectonic deformations - Ultra deeps
Classification code: 408.1 Structural Design, General - 481.1 Geology - 482.2 Minerals - 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 691.2 Materials Handling Methods - 751.2 Acoustic Properties of Materials - 921.6 Numerical Methods - 951 Materials Science
Numerical data indexing: Size 6.00e+03m
DOI: 10.3787/j.issn.1000-0976.2020.01.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

99. Prediction of shale gas preservation conditions by pre-stack geophysical technology: A case study of the shale gas reservoirs in the Jiaoshiba Block of the Sichuan Basin

Accession number: 20202908938674

Title of translation: -
Authors: Zhang, Dianwei (1); Sun, Wei (1); Li, Shuangjian (1); Hao, Yunqing (1); Liu, Ling (1)
Author affiliation: (1) Sinopec Petroleum Exploration and Production Research Institute, Beijing; 100083, China
Corresponding author: Sun, Wei(seagleff@126.com)
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Publication year: 2020
Pages: 42-49
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, the immense exploration potential of shale gas in the Upper Ordovician Wufeng Formation and the Lower Silurian Longmaxi Formation in the eastern Sichuan Basin has been further confirmed especially when great breakthroughs were realized in the Fuling Shale Gas Field of the Sichuan Basin. However, how to apply geophysical technologies to evaluate shale gas preservation conditions more accurately and effectively is a burning problem in shale gas exploration and development in this area. From the perspective of fracture development degree and formation pressure, this paper first applied the fracture prediction technology based on pre-stack azimuthal anisotropy to predict high-angle fractures on the basis of pre-stack seismic data. Then, the pressure prediction technology based on pre-stack P-wave impedance inversion was used to describe the spatial distribution characteristics of formation pressure. Finally, both of them were combined to establish a new parameter for evaluating shale gas preservation conditions, i.e., preservation indicator. In this way, a set of new method that can be used to effectively predict shale gas preservation conditions was developed. This new method was used to evaluate the shale gas preservation conditions in the Wufeng-Longmaxi Fms in the Jiaoshiba Block of Fuling Shale Gas Field, and the prediction results of preservation indicator were compared with the production data of gas wells, which demonstrated that the preservation indicator agreed well with the AOF of a shale gas well, making up the previous mismatch between a low-productivity well and its AOF. In conclusion, the predicted preservation indicator is in line with the production data of gas wells, indicating that this new method is valid and reliable in evaluating shale gas preservation conditions.
Number of references: 21
Main heading: Gas industry
Controlled terms: Forecasting - Fracture - Gases - Geological surveys - Natural gas well production - Natural gas wells - Petroleum prospecting - Petroleum reservoirs - Seismic waves - Seismology - Shale gas
Uncontrolled terms: Azimuthal anisotropy - Distribution characteristics - Exploration potential - Geophysical technologies - Pre-stack seismic data - Preservation condition - Pressure predictions - Shale gas reservoirs
Classification code: 481.1 Geology - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 512 Petroleum and Related Deposits - 522 Gas Fuels - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.06.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

100. Hydrocarbon accumulation conditions of the buried hills in the central paleo-uplift belt of the northern Songliao Basin

Accession number: 20201708556738
Title of translation:
Authors: Sun, Lidong (1); Sun, Guoqing (2); Yang, Buzeng (1); Zhao, Fuhai (2); Li, Jing (1); Li, Guangwei (1); Xu, Yan (1)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Daqing Oilfield Company, Daqing; Heilongjiang; 163712, China; (2) Exploration Department, PetroChina Daqing Oilfield Company, Daqing; Heilongjiang; 163712, China
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Publication year: 2020
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The central paleo-uplift belt is an important deep-seated oil and gas exploration area of the Songliao Basin, but its oil and gas exploration process is restricted due to its complex gas accumulation conditions and for lack of the understanding of its reservoir distribution and hydrocarbon accumulation laws. In order to provide technical support for the efficient oil and gas exploration in this central paleo-uplift belt, this paper carried out systematical studies in terms of gas source conditions, reservoir conditions and hydrocarbon accumulation models by using the drilling, 3D seismic and test data comprehensively. Then, the understandings obtained in the oil and gas exploration practice were summarized and the hydrocarbon accumulation models of the natural gas in this area were confirmed. And the following research results were obtained. First, this paleo-uplift belt is adjacent to the hydrocarbon generation center of Xujiaweizi fault depression and the source rocks of Lower Cretaceous Shahezi Formation have high hydrocarbon generation intensity, wide hydrocarbon supply window, and sufficient gas source. Second, under the effect of early intense extrusion and late tensile extension, a large-scale structure is developed in this paleo-uplift belt, and it has a good structural background and provides good trap conditions for natural gas migration and accumulation. Third, this central paleo-uplift belt suffered long-term exposure and erosion, and a weathering crust of large-area distribution is formed with good reservoir properties. Fourth, the upper part of this central paleo-uplift belt is overlain by the mudstone of the second Member of Denglouku Formation of Lower Cretaceous, which acts as the regional caprock. In conclusion, this central paleo-uplift belt is in the internal hydrocarbon accumulation model of large-area weathering crust under the structural control. By adopting the technology of "horizontal well + large-scale stimulated reservoir volume (SRV)", it is expected to realize a breakthrough in gas productivity of large-area tight gas reservoir in this area.

Number of references: 20
Main heading: Petroleum prospecting
Controlled terms: Gases - Geological surveys - Horizontal wells - Hydrocarbons - Natural gas - Petroleum reservoirs - Structural dynamics - Tensile strength - Tight gas - Weathering
Uncontrolled terms: Hydrocarbon accumulation - Hydrocarbon generation - Large scale structures - Natural gas migration and accumulations - Oil and gas exploration - Reservoir distribution - Stimulated reservoir volumes - Xujiaweizi Fault Depression
Classification code: 408 Structural Design - 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.03.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

101. Variable-parameter amplitude recovery technology for seismic data processing in deepwater areas

Accession number: 20210309770819
Title of translation:
Authors: Chen, Dianyuan (1); Liu, Shiyou (1); Sun, Wanyuan (1)
Author affiliation: (1) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
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Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 41-51
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3

Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In deep-water oil and gas exploration, the acoustic physical characteristics of seawater body have direct effects on the results of subsequent seismic data processing and geophysical technological application. In order to solve the amplitude preservation problem of seismic data in deepwater areas, this paper quantitatively measures the velocity of seismic wave in sea water (hereinafter referred to as seawater velocity) using multiple methods, such as deepwater robot, laboratory seawater measurement and deepwater VSP. Then, it clarifies that seawater velocity has obvious stratified characteristics, and a stratification model is established. Finally, based on the amplitude attenuation difference of seismic wave in sea water and strata, the variable-parameter amplitude recovery technology is put forward, which effectively solves the amplitude preservation problem of seismic data in the shallow water-slope break belt-deep water area. And the following research results were obtained. First, the amplitude attenuation law in sea water is quite different from that in the strata. As for the same propagation distance, the amplitude attenuation of seismic wave in sea water is much weaker than that in the strata. Second, compared with the constant seawater velocity offset section, the stratified seawater velocity offset effect is more advantageous with a continuous event and a high signal-to-noise ratio, which improves overall image resolution and image accuracy. Third, the seismic amplitude change of near, middle and far offset is more reasonable in the direction of offset, which avoids the strong-amplitude anomaly of far offset and makes AVO attributes more reasonable. In conclusion, by making use of the characteristics of the seawater stratified velocity accurately, the quality of seismic image in the areas with variable water depth can be improved significantly. In addition, when the variable-parameter amplitude recovery technology is applied to process the actual seismic data in Lingshui deepwater area of the Qiongdongnan Basin, the amplitude is more balanced and the same reflection formation can be tracked continuously. What's more, the research results lay a foundation for the subsequent reservoir prediction and hydrocarbon detection.
Number of references: 29
Main heading: Seismic prospecting
Controlled terms: Acoustics - Data handling - Hydrocarbon refining - Image enhancement - Image resolution - Offshore gas fields - Petroleum prospecting - Recovery - Seawater effects - Seismic response - Seismic waves - Signal to noise ratio - Velocity
Uncontrolled terms: High signal-to-noise ratio - Hydrocarbon detection - Oil and gas exploration - Physical characteristics - Propagation distances - Reservoir prediction - Seismic data processing - Technological applications
Classification code: 471.4 Seawater, Tides and Waves - 484 Seismology - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 513.1 Petroleum Refining, General - 716.1 Information Theory and Signal Processing - 723.2 Data Processing and Image Processing - 751 Acoustics, Noise. Sound
DOI: 10.3787/j.issn.1000-0976.2020.12.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

102. A new method for logging identification and evaluation of low-resistivity gas layers: A case study of the Dongsheng Gasfield in the Ordos Basin

Accession number: 20205009619824
Title of translation: -
Authors: Zhao, Yonggang (1)
Author affiliation: (1) Well Logging Company, Sinopec North China Petroleum Engineering Company, Zhengzhou; 450006, China
Corresponding author: Zhao, Yonggang(zhao.y.g@163.com)
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Issue date: September 25, 2020
Publication year: 2020
Pages: 47-54
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency
Abstract: As the natural gas development in the Dongsheng Gasfield of the Ordos Basin steps into middle and late stages, some wells have successively drilled into low-resistivity gas layers, the electrical property of which is rarely different from that of water layers. There is not sufficient analysis and experiment data on low-resistivity gas layers and their genetic mechanisms have not been understood clearly, which brings about difficulties to their identification and results in adverse influences on their reservoir productivity evaluation and prediction. In order to provide reliable technical support for the efficient natural gas development in the late stage of Dongsheng Gasfield, this paper firstly summarized the logging response characteristics of low-resistivity gas layers in this area. Then, based on genetic mechanism analysis, conventional logging identification methods of low-resistivity gas layers were investigated and some new methods were put forward, including the log overlapping method and the four porosity difference/ratio method. And the following research results were obtained. Apart from the distribution form of shale, the cationic additional conductivity of clay mineral and the invasion of drilling fluid, the genesis of low-resistivity gas layers is influenced mainly by the following two types of factors. One is low-resistivity gas layers caused by high porosity, high permeability and high movable water saturation. The other is the product of high bound water (capillary water) saturation caused by complex pore structures. In other words, bound water is mainly capillary water, which forms a good conductive network, resulting in the occurrence of low resistivity characteristics in the reservoir. In conclusion, when the proposed conventional logging method is used to identify low-resistivity gas layers, the identification effect is better with an interpretation coincidence rate as high as 83%. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 20
Main heading: Natural gas wells
Controlled terms: Drilling fluids - Gases - Infill drilling - Metamorphic rocks - Natural gas - Petroleum reservoir evaluation - Pore structure - Porosity
Uncontrolled terms: Conductive networks - Conventional logging - High permeability - Identification and evaluation - Identification method - Natural gas development - Porosity difference - Productivity evaluation
Classification code: 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
Numerical data indexing: Percentage 8.30e+01%
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103. A novel weighted multi-point source thermal radiation model based on inversion optimization of heat source weight parameters

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Title of translation:
Authors: Zhou, Zhihang (1, 2); Chen, Guohua (1, 2)
Author affiliation: (1) Institute of Safety Science and Engineering, South China University of Technology, Guangzhou; 510640, China; (2) Guangdong Provincial Science and Technology Collaborative Innovation Center for Work Safety, Guangzhou; 510640, China
Corresponding author: Chen, Guohua(mmghchen@scut.edu.cn)
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Language: Chinese
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to solve the problem of over-simplified weight distribution of heat source in the original weighted multi-point source thermal radiation model (WMPM), a series of medium-scale natural gas jet fire experiments were conducted, in which heat release of 3.5 MW and the flame Froude number of 4.46 were both considered. Based on the experimental data about the length characteristic parameters and near field thermal radiation of jet fire, the Chicken

Swarm Optimization (CSO) algorithm was utilized to invert and optimize the weight distribution parameters of heat sources in the WMPM and explore the influence of test conditions on weight parameters. The optimization results showed that with an increase in flame Froude number, the axial position for peak weight of heat source decreases gradually and the weight distribution of heat source at the both sides of the peak weight becomes balanced gradually. In addition, it was found that the weight distribution of heat source along the relative axial position of the flame can be characterized properly by a double exponential function. The constant coefficients in the double exponential function vary linearly with flame Froude number. Furthermore, a correlation describing weight distribution of heat source associating with flame Froude number was proposed. On this basis, a novel WMPM was thus developed. Compared to the original WMPM, the novel WMPM can significantly improve the prediction accuracy of thermal radiation in the near field of jet fire. In this test, the relative average deviation of prediction results was found to be reduced to 7.68% from the previous 12.87%, while the maximum relative deviation was down to 14.69% from the previous 19.83%.
Number of references: 45
Main heading: Scales (weighing instruments)
Controlled terms: Exponential functions - Froude number - Heat radiation
Uncontrolled terms: Average deviation - Constant coefficients - Double exponential functions - Prediction accuracy - Relative deviations - Swarm optimization - Thermal radiation models - Weight distributions
Classification code: 631.1 Fluid Flow, General - 641.2 Heat Transfer - 921 Mathematics - 943.3 Special Purpose Instruments
Numerical data indexing: Percentage 1.29e+01%, Percentage 1.47e+01%, Percentage 1.98e+01%, Percentage 7.68e+00%, Power 3.50e+06W
DOI: 10.3787/j.issn.1000-0976.2020.10.017
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

104. Dynamic change laws of the permeability of coal containing gas under the effect of coal matrix deformation

Accession number: 20200908220885
Title of translation:
Authors: Li, Xiangchun (1, 2); Huang, Tao (1); Chen, Xiaolong (1); An, Zhenxing (1); Lu, Weidong (2, 3); Chen, Zhifeng (3)
Author affiliation: (1) College of Emergency Management and Safety Engineering, China University of Mining and Technology, Beijing; 100083, China; (2) Henan Provincial State Key Laboratory for Gas Geology and Gas Control, Jiaozuo; Henan; 454000, China; (3) College of Safety Science and Engineering, Xinjiang Institute of Engineering, Urumqi; Xinjiang; 830091, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: January 25, 2020
Publication year: 2020
Pages: 83-87
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Coal permeability not only has a direct effect on the exploitation effect of coalbed methane (commonly called gas), but also is the key parameter in the calculation of gas emission. In order to investigate the variation laws of the permeability of coal-containing gas under different pressures, it is necessary to establish a dynamic evolution model of the permeability of coal-containing gas under different pressures by considering the comprehensive effects of effective stress and gas adsorption/desorption on coal permeability. Then, a permeability measurement experiment under triaxial stress state was carried out on the coal samples taken from Yuecheng Mine Field of Shanxi Jinmei Group. Moreover, the experimental results and model calculation results were compared. Finally, the dynamic variation laws of the permeability of coal-containing gas under different pressures were discussed. And the following research results were obtained. First, the permeability-pressure relationship curve is in an irregular "U" shape. In the phase of lower pressure, as the pressure increases, the amount of the gas adsorbed by the surface of coal matrix increases,

the influence of coal rock expansion deformation on the permeability is dominant and the permeability decreases rapidly. As the pressure gradually increases, the gas adsorption capacity gets saturated, the effect of effective stress on permeability gradually dominates and the permeability increases slightly. Second, the experimental results and the model calculation results are basically accordant and their variation trends are also consistent. It is concluded that the proposed dynamic evolution model for the permeability of coal-containing gas is reliable and can provide technical support for the prevention of coal and gas outburst and the effective exploitation of coalbed methane.
Number of references: 20
Main heading: Gas permeability
Controlled terms: Coal - Coal bed methane - Coal deposits - Coal industry - Coal mines - Deformation - Firedamp - Gas adsorption - Methane - Porosity
Uncontrolled terms: Coal containing gas - Coalbeds - Different pressures - Dynamic permeability - Effective stress - Methane adsorption - Methane desorption
Classification code: 503 Mines and Mining, Coal - 503.1 Coal Mines - 522 Gas Fuels - 524 Solid Fuels - 802.3 Chemical Operations - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.01.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

105. Correlation of shale core analysis results and its influencing factors

Accession number: 20200908220943
Title of translation:
Authors: Wang, Shiqian (1)
Author affiliation: (1) Research Institute for Shale Gas, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China
Corresponding author: Wang, Shiqian(wsq-618@petrochina.com.cn)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 1
Issue date: January 25, 2020
Publication year: 2020
Pages: 160-174
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Over the last decade, a large number of gas-shale cores have been acquired during the exploitation of the Lower Paleozoic Wufeng-Longmaxi shale gas in the Southern Sichuan Basin, and in the joint appraisal of shale gas blocks in cooperation with several overseas international petroleum companies. Therefore, huge quantities of shale core data about shale mineralogy, geochemistry, petrophysics and gas content have been accumulated and measured in different labs at home and abroad. By correlating the core data from the same piece of sample or from the samples in the same intervals, it is found that there are obvious disparity with the analysis results from different labs, between different analytical methods, even from different types of samples, different ways of sampling, and different parts of the same sample, which certainly has an affect on the objective understanding of shale reservoirs and the exploitation prospect in this study area. Based on the case studies of several data quality issues, some influencing factors causing the inconsistency of the shale core analysis results are discussed, such as sample types, sampling location, sampling methods and test facility. In order to reduce the impact of these factors, it is suggested that a systematic and standardized analysis procedure and robust methods for tight rock analysis from the shale core handling to standardized sampling and testing should be put forward in shale oil and gas industry. It is concluded that attention to quality issues related with shale core analysis must be paid. In addition to the scientific analysis quality assurance and quality control set up inside the laboratory, the external quality assessment and feedback from data users are also an important way for promoting and improving the quality of core analysis.
Number of references: 44
Main heading: Quality control

Controlled terms: Core analysis - Core samples - Factor analysis - Gas industry - Gases - Minerals - Petroleum industry - Petrophysics - Quality assurance - Shale - Shale gas - Test facilities
Uncontrolled terms: Influencing factor - Interlab comparison - Sampling location - Sampling method - Sichuan Basin
Classification code: 481.4 Geophysical Prospecting - 482.2 Minerals - 522 Gas Fuels - 913.3 Quality Assurance and Control - 922.2 Mathematical Statistics
DOI: 10.3787/j.issn.1000-0976.2020.01.021
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

106. High-quality development of ultra-deep large gas fields in China: Challenges, strategies and proposals

Accession number: 20201208317947
Title of translation: ,
Authors: Li, Xizhe (1); Guo, Zhenhua (1); Hu, Yong (1); Liu, Xiaohua (1); Wan, Yujin (1); Luo, Ruilan (1); Sun, Yuping (1); Che, Mingguang (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 2
Issue date: February 25, 2020
Publication year: 2020
Pages: 75-82
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Natural gas from ultra-deep reservoirs has been a major contributor for reserves boost, deliverability construction, and profits growth in natural gas industry in China. As a significant strategic domain in the future development of upstream business, the high-quality development of ultra-deep gas resources has great significance for economic benefits enhancement and sustained regional supply assurance. In this paper, based on the appraisal of development characteristics and effectiveness in the developed large ultra-deep gas fields, challenges for high quality development were indicated, which include the difficulties in structure confirm, uncertainties in reserves define and production optimization, risks of aquifer water early breakthrough and high investment of deep wells. Through indoor physical simulation experiments, reservoir characterization, performance evaluation, reservoir simulation and knowledge acquisition from analogous fields at home and abroad, the connotation and requirements for high quality development were discussed, and furthermore, strategies and proposals were thus proposed as follows: to strengthen the pre-development reservoir evaluation to define movable gas reserves and quantify rational production rate so as to avoid facility waste; to optimize both well location disposition and well flow rate to achieve uniform depletion and high EUR; to continuously enhance drilling & completion technologies to further reduce drilling and completion circle and cost and targeted reservoir stimulation technologies to enhance movable reserves and single-well productivity and increase the depletion of inferior reserves; and to innovate management modes to establish scientific programs and procedures for the construction, production and operation of ultra-deep gas fields and strictly control the upper limit index of production rate so as to emphasize quality benefits. In conclusion, high-quality development of ultra-deep gas fields, a hard and complicated system though, will be possibly achieved only by continuous innovation of exploration and development technologies and management modes.
Number of references: 17
Main heading: Reservoir management
Controlled terms: Aquifers - Economics - Energy resources - Gas industry - Gases - Infill drilling - Knowledge acquisition - Natural gas - Natural gas well completion - Natural gas well production - Natural gas wells - Petroleum reservoir evaluation - Planning - Proven reserves - Quality control - Waste management - Well stimulation

Uncontrolled terms: Drilling and completion - High quality - Large gas field - Reservoir stimulations - Strategies and proposals - Ultra deeps
Classification code: 444.2 Groundwater - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 723.4 Artificial Intelligence - 912.2 Management - 913.3 Quality Assurance and Control - 971 Social Sciences
DOI: 10.3787/j.issn.1000-0976.2020.02.008
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

107. Development and laboratory experiments of pressure-controlled sliding sleeves for injection and crushing operations in the exploitation of deep sea shallow non diagenetic marine gas hydrates

Accession number: 20204909594224
Title of translation:
Authors: Tang, Yang (1, 2); Yao, Jiaxin (1); Wang, Guorong (1, 2); Zhong, Lin (1); He, Yufa (3); Liu, Qingyou (1, 4); Zhou, Shouwei (5)
Author affiliation: (1) College of Mechatronic Engineering, Southwest Petroleum University, Chengdu; 610500, China; (2) Guangdong Laboratory of Southern Marine Science and Engineering-Zhanjiang, Zhanjiang; 524000, China; (3) CNOOC Research Institute Co., Ltd., Beijing; 100020, China; (4) State Key Laboratory of Oil & Gas Reservoir Geology and Development Engineering, Chengdu University of Technology, Chengdu; 610051, China; (5) CNOOC Co., Ltd., Beijing; 100011, China
Corresponding author: Yao, Jiaxin(yaojiaxin7361@163.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 8
Issue date: August 25, 2020
Publication year: 2020
Pages: 186-194
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: This paper aims to solve the problem of uncontrollable, non-reusable operation of jet nozzles in natural gas hydrate solid fluidized mining operation and reduce the tedious work of repeatedly lifting the drill string and so on. Based on the principle of throttling pressure drop and natural gas hydrate solid fluidization mining technology, and according to the characteristics of deep-sea shallow non-diagenetic natural gas hydrate, a kind of jet nozzle was designed, which can be controlled to open and close while the operation process is not affected by water depth and well depth. The pressure-controlled sliding sleeve was simulated and experimentally studied. Research results indicate: (1) The larger the cone angle at the entrance of the sliding sleeve, the greater the pressure drop and axial force generated by the sliding sleeve, but the more serious the erosion of drilling fluid on the cone surface. Therefore, considering the above factors, the sliding sleeve is comprehensively considered with 30° as the best cone angle; (2) the greater the flow rate of drilling fluid through the sliding sleeve, the greater the pressure drop generated inside the sliding sleeve and the axial force of the sliding sleeve; (3) The results of the opening and closing test indicate that the sliding sleeve can slide and open the jet nozzle under the action of drilling fluid, with a full opening flow rate of the nozzle being 833 L/min, and the error value of the design flow being 4.13%. (4) The test results show that the pressure inside the pressure-controlled sliding sleeves cannot be driven, which effectively verifies that its working condition is not affected by environmental pressure. The research and application of this tool can promote the progress in solid state fluidization technology of marine gas hydrates. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 30
Main heading: Deep sea mining
Controlled terms: Axial flow - Computer software reusability - Cones - Drill strings - Drilling fluids - Drops - Fluidization - Gas hydrates - Gases - Hydration - Infill drilling - Natural gas - Natural gas wells - Nozzle design - Nozzles - Pressure drop
Uncontrolled terms: Environmental pressures - Fluidization technology - Laboratory experiments - Marine gas hydrates - Mining operations - Mining technology - Operation process - Research and application

Classification code: 472 Ocean Engineering - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631.1 Fluid Flow, General - 723 Computer Software, Data Handling and Applications - 802.3 Chemical Operations
Numerical data indexing: Percentage 4.13e+00%
DOI: 10.3787/j.issn.1000-0976.2020.08.016
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

108. Characteristics and geological significance of fluid inclusions in the Lower Permian Shanxi Formation in the Yan'an Gas Field

Accession number: 20202308799552
Title of translation:
Authors: Zhou, Jinsong (1); Qiao, Xiangyang (1); Wang, Ruogu (1); Yin, Xiao (1); Liu, Peng (1)
Author affiliation: (1) Research Institute of Shaanxi Yanchang Petroleum Co., Ltd., Xi'an; Shaanxi; 710075, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 4
Issue date: April 25, 2020
Publication year: 2020
Pages: 20-29
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In recent years, great breakthroughs have been made in natural gas exploration in Upper Paleozoic in the southeastern Ordos Basin. In order to understand the gas accumulation process of Upper Paleozoic in this area, this paper analyzed the characteristics of reservoir fluid inclusions (e. g. color, form, composition and homogenization temperature) by taking the principal pay zone of Upper Paleozoic gas reservoir in the Yan'an Gas Field of southeastern Ordos Basin as an example. Then, combined with the burial history and thermal history simulation, the formation period of fluid inclusions was determined, and the geological age of the hydrocarbon charging was defined, and the coupling relationship between hydrocarbon charging and diagenetic evolution was analyzed. And the research conclusions were as follows. First, the reservoir fluid inclusions of Shanxi Formation in the Yan'an Gas Field mainly exist in authigenic quartzs, carbonate cements and concrescence fractures of quartz grain, and they are classified into three types, i. e., CO2 inclusion, hydrocarbon inclusion and brine inclusions. Second, the formation of hydrocarbon inclusions is mainly divided into two phases. In the first phase, they are mainly developed at quartz overgrowth edges and concrescence fractures of quartz grain, where the homogenization temperature is between 90 and 110 and the gas hydrocarbon components are mainly rich in CO2 and CH4. And in the second phase, they are mainly developed at quartz overgrowth edges, carbonate cements and concrescence fractures of quartz grain, where the homogenization temperature is between 130 and 160, and the gas hydrocarbon component is rich in CH4. Third, there are two hydrocarbon charging phases in the Shanxi Formation. The first phase occurred in the Late Triassic to the Early and Middle Jurassic, during which the organic matter began to generate, expel and charge hydrocarbon, secondary pores were formed by the dissolution of feldspar and lithic, and chemical pressure dissolution initially occurred and generated a small number of quartz overgrowth edges. In the Middle and Late Jurassic, source rocks entered the mature stage and began to generate and expel a great amount of hydrocarbon; the second phase of hydrocarbon charging began; the chemical pressure dissolution was strengthened; and the quartz cement was developed in a great quantity. In the Early Cretaceous, source rocks reached the high and over-mature stage and generated a large amount of gas, quartz cements continued to grow, and ferroan dolomite began to precipitate. Since the end of the Early Cretaceous, hydrocarbon generation from source rocks gradually ceased.
Number of references: 23
Main heading: Petroleum prospecting
Controlled terms: Carbon dioxide - Cements - Dissolution - Feldspar - Fracture - Gases - Geology - Hydrocarbons - Metamorphic rocks - Mineralogy - Petroleum reservoirs - Quartz

Uncontrolled terms: Coupling relationships - Diagenetic evolution - Geological significance - Homogenization temperatures - Hydrocarbon generation - Natural gas exploration - Reservoir fluid inclusions - Thermal history simulation
Classification code: 412.1 Cement - 481.1 Geology - 482 Mineralogy - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 802.3 Chemical Operations - 804.1 Organic Compounds - 804.2 Inorganic Compounds - 951 Materials Science
DOI: 10.3787/j.issn.1000-0976.2020.04.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

109. A new method for calculating the critical cohesive force of borehole stability in air drilling: A case study of the Heiloumen structure in the eastern Sichuan Basin

Accession number: 20210109725837
Title of translation: -
Authors: Xia, Hongquan (1); Wang, Duo (1); Liu, Sujun (2)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; 610500, China; (2) Drilling & Production Engineering Technology Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Guanghan; 618300, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
Issue: 10
Issue date: October 25, 2020
Publication year: 2020
Pages: 44-53
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Air drilling has many advantages, but the traditional formation collapse pressure calculation method fails to judge accurately whether a certain formation adapts to air drilling. And one of the technical methods to solve this problem is to make use of well logging data to analyze the formation adaptability of the drilled hole sections to air drilling. According to the relevant requirements of air drilling, this paper firstly carried out log interpretation on the oil/gas/water layers in a single well section. Then, according to the criteria of borehole stability, a new method for calculating the critical cohesive force of borehole stability in air drilling was established on the basis of the traditional formation collapse pressure calculation method. In this new method, the specific hole section suitable for air drilling can be quantitatively determined by calculating rock cohesive force and critical cohesive force point by point. And the following research results were obtained. First, the new method can be used to determine the hole section suitable for air drilling according to the formation requirements of air drilling, by comparing the rock cohesive force and critical cohesive force in the log interpretation result diagrams. By virtue of this new method, the hole section suitable for air drilling in a new well can be quantitatively recommended and selected. Second, by taking the hole section 520-7 265 m of Well Loutan 1 in Heiloumen structure of eastern Sichuan Basin as the example, the new method determines the hole sections suitable for air drilling, including 1 910-3 432 m in the second Member of Lower Triassic Jialingjiang Formation-Middle Silurian Hanjiadian Formation and 4 345-6 690 m in the Lower Silurian Longmaxi Formation-Middle Cambrian Gaotai Formation. In conclusion, the new method provides reference and basis for the implementation of air drilling in the eastern Sichuan Basin and even in the whole Sichuan Basin.
Number of references: 22
Main heading: Boreholes
Controlled terms: Infill drilling - Oil well drilling - Oil well logging - Oil wells - Stability criteria - Well logging
Uncontrolled terms: Borehole stability - Cohesive force - Collapse pressure - Jialingjiang formation - Log interpretation - Lower triassic - Research results - Well logging data
Classification code: 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 961 Systems Science
Numerical data indexing: Size 1.91e+03m to 3.43e+03m, Size 4.34e+03m to 6.69e+03m, Size 5.20e+02m to 7.26e+03m

DOI: 10.3787/j.issn.1000-0976.2020.10.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

110. Enrichment model of normal-pressure shale gas in the Jinfo slope of the basin-margin transition zone in Southeast Chongqing

Accession number: 20202908938171
Title of translation:
Authors: He, Guisong (1); He, Xipeng (1); Gao, Yuqiao (1); Wan, Jingya (1); Zhang, Peixian (1); Zhang, Yong (1); Gao, Hequn (1)
Author affiliation: (1) Research Institute of Exploration and Development, Sinopec East China Company, Nanjing; Jiangsu; 210011, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue: 6
Issue date: June 25, 2020
Publication year: 2020
Pages: 50-60
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Recently, the newly drilled shale gas well in the Jinfo slope of the transition zone along the margin of the southeast Chongqing Basin produced a high-yield gas flow from the Upper Ordovician Wufeng Formation and the Lower Silurian Longmaxi Formation with a formation pressure coefficient being up to 1.18, demonstrating a great breakthrough in the exploration of normal pressure shale gas in this area. In order to evaluate the exploration potential of this type of shale gas reservoirs, this paper analyzed the basic geological characteristics and the shale gas enrichment rules of shale gas reservoirs in the Jinfo slope based on drilling, geophysical exploration and test data. Then, the main factors controlling the enrichment and high yield of normal-pressure shale gas were summarized, and the shale gas enrichment model was established. Finally, the favorable target area for the exploration and development of normal-pressure shale gas in this area was predicted. And the following research results are obtained. First, the high-quality shale in this area is characterized by good gas generation conditions, high siliceous mineral content, good reservoir physical properties and high gas content, presenting a greater shale gas exploration potential. Second, the enrichment and high yield of normal-pressure shale gas follows the rule of "three-factor gas control", i.e., sedimentary facies controlling hydrocarbon supply and reservoirs, tectonic movement controlling preservation and enrichment, and in-situ stress field controlling fractures and production. Third, the sealing capacity of the sealing reverse thrust fault which is developed in the updip direction of the slope-type target layer is conducive to the formation of a good preservation unit in the fault footwall. As the burial depth and the distance from the denudation boundary increase, the shale gas enrichment degree and the single-well production rate increase. In conclusion, the research results enrich the geological theory of normal-pressure shale gas and provide support for the exploration and development of normal-pressure shale gas in the complex tectonic areas, especially in the slopes, in southern China,.
Number of references: 20
Main heading: Petroleum prospecting
Controlled terms: Faulting - Flow of gases - Gases - Geological surveys - Infill drilling - Mineral exploration - Natural gas well production - Petroleum reservoirs - Shale gas - Stresses
Uncontrolled terms: Exploration and development - Exploration potential - Geological characteristics - Geophysical exploration - In-situ stress field - Reservoir physical property - Shale gas reservoirs - Single well production
Classification code: 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 501.1 Exploration and Prospecting Methods - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1.2 Gas Dynamics
DOI: 10.3787/j.issn.1000-0976.2020.06.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

111. Control effects of temperature and thermal evolution history of deep and ultra-deep layers on hydrocarbon phase state and hydrocarbon generation history

Accession number: 20201208317665
Title of translation: ,
Authors: Ren, Zhanli (1, 2); Cui, Junping (1, 2); Qi, Kai (2); Yang, Guilin (2); Chen, Zhanjun (3); Yang, Peng (2); Wang, Kun (2)
Author affiliation: (1) State Key Laboratory of Continental Dynamics, Northwest University, Xi'an; Shaanxi; 710069, China; (2) Department of Geology, Northwest University, Xi'an; Shaanxi; 710069, China; (3) Longdong University, Qingyang; Gansu; 745000, China
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Abbreviated source title: Natur. Gas Ind.
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Issue: 2
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Publication year: 2020
Pages: 22-30
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Deep and ultra-deep layers in the oil and gas bearing basins of China are characterized by large temperature difference and complicated thermal evolution history. The control effects of temperature and thermal evolution history on the differences of hydrocarbon phase states and the hydrocarbon generation history in deep and ultra-deep layers are researched less and unsystematically. To deal with this situation, based on a large number of temperature and pressure data of deep layers and combined with the complicated historical situation of deep layer evolution in the oil and gas basins of China, the effects of temperature, heating time and pressure on the hydrocarbon formation temperature and phase state were analyzed, and the type of temperature and pressure relationship was classified. Finally, based on the classification of thermal evolution history of deep and ultra-deep layers, the control effects of thermal evolution history of the basins with different types of thermal history on the hydrocarbon generation and phase state were discussed. And the following research results were obtained. First, the hydrocarbon phase states of deep layers in different basins and regions are greatly different, and they are mainly affected by temperature, heating time, heating rate, pressure, source rock type and other factors. And temperature is the most important factor controlling hydrocarbon generation and phase state distribution. Second, under the conditions of rapid temperature increase and short heating time, there still may be oil reservoirs and condensate gas reservoirs in deep and ultra-deep layers in the case of high temperature. Third, overpressure inhibits hydrocarbon generation and pyrolysis. Fourth, there is a close relationship between temperature and formation pressure of deep layers, which can be divided into three types, i.e., low-medium temperature and high pressure type, high temperature and high pressure type, and medium temperature and low-medium pressure type. Fifth, the thermal evolution history of deep and ultra-deep layers can be divided into four types, namely the late rapid subsidence, heating and low geothermal gradient type, the late rapid subsidence, heating and high geothermal gradient type, the middle-late rapid heating and late uplifting and cooling type, and the early great subsidence and rapid heating and middle-late great uplift erosion and cooling type. In conclusion, deep and ultra-deep layers in the basins with different types of thermal history are different in hydrocarbon phase states, accumulation stages and prospects. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 42
Main heading: Temperature
Controlled terms: Heating - Hydrocarbons - Petroleum prospecting - Petroleum reservoir engineering - Petroleum reservoirs - Subsidence
Uncontrolled terms: Abnormal pressure - Accumulation periods - Deep layer - Geothermal gradients - Heating time - Hydrocarbon phase - Superimposed basin - Thermal evolution history - Ultra deeps
Classification code: 483.1 Soils and Soil Mechanics - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 641.1 Thermodynamics - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.02.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

112. Identification and oil and gas exploration practices of reworked residual paleovolcanic edifice in the Junggar Basin

Accession number: 20201708556784
Title of translation:
Authors: Huang, Yun (1); Liang, Shuyi (2); Jia, Chunming (1); Gu, Xinping (1); Mao, Haibo (1); Fu, Xiaopeng (1)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Xinjiang Oilfield Company, Urumqi; Xinjiang; 830013, China; (2) School of Geosciences and Technology, China University of Petroleum - East China, Qingdao; Shandong; 266580, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue: 3
Issue date: March 25, 2020
Publication year: 2020
Pages: 30-37
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: By now, no any operable identification technology system has been developed for the Carboniferous volcanic edifice in the belly area of the Junggar Basin which is deformed due to multi-stage tectonic movement and weather-worn reworking, which restricts the exploration and development process of the Carboniferous volcanic gas reservoirs in this area. By analyzing the identification characteristics (e.g. the outcrop volcanic crater, the typical lithological combination of volcanic crater facies, the resistivity section inversed by the electric field sounding, the seismic facies and the seismic attributes), this paper summarized the comprehensive identification methods and the key seismic data processing technologies for the volcanic edifices in this area and defined the distribution characteristics of high-quality volcanic reservoirs. In addition, the areas favorable for the distribution of high-quality volcanic reservoirs were predicted by taking Jinlong and Kelameili gas fields as examples, so as to provide the guidance for the selection of well test horizons. And the following research results were obtained. First, the recognition of the outcrop paleovolcanic edifice pattern around the Junggar Basin can provide a reliable physical model for the identification of the deep-seated paleovolcanic edifice in the basin, which is of great significance to the basin-mountain integrated study. Second, cryptoexplosive breccia, fused volcanic breccia, perlite and spherulite rhyolite are important lithologic signs to identify paleovolcanic craters. High-quality volcanic reservoirs are mainly distributed in the volcanic breccia of explosive facies and the volcanic lava of overflow facies. Third, by virtue of gravity and magnetic exploration, volcanic rocks and sedimentary rocks can be distinguished, but the vertical resolution is low. This defect is made up for by the method of artificial electric field sounding. The form and occurrence of volcanic rocks represented in the resistivity inversion section can be used as the basis for the identification of volcanic edifice. Fourth, the seismic section method can identify the vertical characteristics of volcanic edifice and 3D seismic attribute can provide the areal distribution information of volcanic edifice, but neither of them can work without high-quality seismic data. In conclusion, seismic data processing and imaging technology is the key technology to identify the reworked residual volcanic edifices. In addition, the proposed comprehensive volcanic edifice identification method presents good application results, thus it can be used to predict the areal distribution of a volcanic reservoir, so as to guide well deployment, geological engineering design and well test horizon selection. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 18
Main heading: Volcanic rocks
Controlled terms: Buildings - Data handling - Economic geology - Electric fields - Imaging techniques - Lithology - Magnetic prospecting - Oil wells - Petroleum prospecting - Petroleum reservoirs - Reservoirs (water) - Sedimentary rocks - Seismic response - Seismic waves - Volcanoes - Well testing
Uncontrolled terms: Distribution characteristics - Exploration and development - Identification method - Identification technology - Oil and gas exploration - Seismic data processing - Vertical characteristics - Vertical resolution
Classification code: 402 Buildings and Towers - 441.2 Reservoirs - 481.1 Geology - 481.4 Geophysical Prospecting - 482.2 Minerals - 484 Seismology - 484.2 Secondary Earthquake Effects - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 701.1 Electricity: Basic Concepts and Phenomena - 701.2 Magnetism: Basic Concepts and Phenomena - 723.2 Data Processing and Image Processing - 746 Imaging Techniques

DOI: 10.3787/j.issn.1000-0976.2020.03.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

113. Equal-strength multi-objective optimization of dual derricks of the seventh-generation ultra-deep water offshore drilling rigs

Accession number: 20210309770779
Title of translation:
Authors: Jiang, Faguang (1, 2); Zhang, Min (1, 2); Yang, Xiuju (3); Liang, Zheng (1, 2)
Author affiliation: (1) School of Mechatronic Engineering, Southwest Petroleum University, Chengdu; 610500, China; (2) Key Laboratory of Oil & Gas Equipment, Ministry of Education, Chengdu; 610500, China; (3) CNPC Baoji Oilfield Machinery Co., Ltd., Baoji; 721002, China
Source title: Natural Gas Industry
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Pages: 124-132
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The dual derrick of the seventh-generation ultra-deep water offshore drilling rigs is structurally bulky with a small safety factor, large deformation and low material utilization ratio. In order to solve these unreasonable design problems, this paper carried out design optimization on the dual derrick based on the concept of equal strength. Firstly, the stress and displacement variation rules of dual derrick at different beam section parameters under typical working conditions were analyzed by referring to API Spec 2C-2004 standard and using finite element method. Then, taking the mass, maximum stress, maximum displacement and stress difference degree at different height segments of dual derrick as optimization objectives, beam section parameters were optimized using single factor and response surface method, and accordingly the optimal section parameter combination was obtained. And the following research results were obtained. First, under the working condition of storm survival, the safety factor of the preliminarily designed dual derrick is lower than the required value in the API Spec 4F-2013 (1.67), the maximum displacement is greater than the allowable value in the specification (l/400), and the lower pillar and the top cross beam are the most dangerous positions. Second, the stress of the dual derrick decreases with the increase of the height, so the sectional strength of the beam shall be considered from bottom to top in the design. Third, the final dual derrick optimization scheme meets the requirements of various typical working conditions, and compared with the original one, its mass, maximum stress, maximum displacement and maximum stress deviation rate at different height segments are reduced by 16.18%, 29.25%, 29.35% and 67.67% respectively and the material utilization ratio is improved. In conclusion, the equal-strength multi-objective section parameter optimization which combines single factor with response surface method is of guiding significance to structural parameter optimization and the related derrick design.
Number of references: 19
Main heading: Multiobjective optimization
Controlled terms: Cranes - Deepwater drilling - Drilling platforms - Drilling rigs - Infill drilling - Occupational risks - Offshore oil well production - Safety factor - Structural optimization - Surface properties
Uncontrolled terms: Guiding significances - Material utilization - Maximum displacement - Parameter combination - Parameter optimization - Response surface method - Stress and displacements - Structural parameter
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 693.1 Cranes - 914.1 Accidents and Accident Prevention - 921.5 Optimization Techniques - 951 Materials Science
Numerical data indexing: Percentage 1.62e+01%, Percentage 2.92e+01%, Percentage 2.94e+01%, Percentage 6.77e+01%
DOI: 10.3787/j.issn.1000-0976.2020.12.014
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

114. Seismic response characteristics of the Lower Cambrian Longwangmiao Formation reservoirs in the eastern Sichuan Basin

Accession number: 20205009619809
Title of translation:
Authors: Xi, Cheng (1); He, Yuan (1); Lyu, Yan (1); Li, Yi (2); Bai, Xiaoliang (1); Wu, Shihu (1); Li, Hong (3)
Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China; (2) Sichuan Branch, PetroChina Kunlun Gas Co., Ltd., Chengdu; 610199, China; (3) Chongqing Division of PetroChina Southwest Oil & Gasfield Company, Chongqing; 402160, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Publication year: 2020
Pages: 39-46
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The discovery of the supergiant gas reservoirs in the Lower Cambrian Longwangmiao Formation in the central Sichuan Basin reveals a great natural gas exploration potential in the periphery of Leshan-Longnüsi paleouplift. Shoal-facies reservoirs are also discovered in the Longwangmiao Formation of eastern Sichuan Basin, which indicates that the natural gas exploration area may expand to the eastern basin. In order to determine the natural gas exploration potential of Longwangmiao Formation there, it is necessary to make further studies on the reservoir identification and prediction of this area. Through petrophysical experiments, this paper carried out forward modeling researches based on wave equation. Then, the seismic reflection characteristics of the Longwangmiao Formation reservoirs in the eastern Sichuan Basin were summarized and compared with those in the typical well of the central Sichuan Basin. Finally, the natural gas exploration potential of Longwangmiao Formation in the eastern Sichuan Basin was evaluated. And the following research results were obtained. First, the Longwangmiao Formation reservoir in the eastern Sichuan Basin has an obvious seismic reflection anomaly when it is developed at the top and in the middle parts, but no obvious seismic reflection anomaly when it is developed in the middle-lower parts. Second, when the Longwangmiao Formation reservoir in the eastern Sichuan Basin is developed at the top, there is a complex wave reflection at the top boundary of Longwangmiao Formation; and when it is developed in the middle-upper parts, bright spots develop inside the Longwangmiao Formation. Third, the seismic reflection characteristics of the Longwangmiao Formation in the eastern Sichuan Basin are similar to those in the central Sichuan Basin. In conclusion, the Wubaitixi-Wushankan-Zhengbanan area and the eastern area of Wubaochang structure shall be taken as the first choice for natural gas exploration in the next step. The above areas are expected to make a breakthrough in natural gas exploration in Longwangmiao Formation in the eastern Sichuan Basin.
Number of references: 17
Main heading: Petroleum prospecting
Controlled terms: Gases - Geological surveys - Natural gas - Petroleum reservoirs - Seismic waves - Seismology
Uncontrolled terms: Central Sichuan Basin - Forward modeling - Lower cambrians - Natural gas exploration - Research results - Seismic reflection characteristics - Seismic reflections - Seismic response characteristics
Classification code: 481.1 Geology - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels
DOI: 10.3787/j.issn.1000-0976.2020.09.005
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

115. Great discovery of oil and gas exploration in Cambrian Canglangpu Formation of the Sichuan Basin and its implications

Accession number: 20205209695927
Title of translation:
Authors: Yue, Hong (1); Zhao, Luzi (1); Yang, Yu (1); Xie, Jirong (3); Wen, Long (2); Luo, Bing (2); He, Yuan (2); Chen, Youlian (2); Wang, Wenzhi (2)
Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China; (2) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610041, China; (3) Exploration Division, PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China
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Publication year: 2020
Pages: 11-19
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Recently, high-yield gas flow with a tested production rate of 51.62×104 m3/d was obtained from Well Jiaotan 1, a wildcat well of PetroChina Southwest Oil & Gasfield Company in the Lower Cambrian Canglangpu Formation on the north slope of Moxi area, central Sichuan Basin, which means realizing a major natural gas exploration breakthrough in another formation of Cambrian after the gas reservoir of Lower Cambrian Longwangmiao Formation. In order to further understand this formation, this paper comprehensively analyzes its hydrocarbon accumulation conditions based on regional geological background and gas reservoir exploration history, combined with the petroleum geological conditions of Canglangpu Formation in the Sichuan Basin. And the following research results were obtained. First, the Sichuan Basin and its periphery were overall located in the depositional system of shallow shelf in the Canglangpu Age of Early Cambrian. And In the early stage of Canglangpu Age, Deyang-Anyue faulted depression was not leveled out. And under the control of palaeogeomorphology and provenance, clear-water shelf carbonate deposits were dominant and dolomitized grain beach facies was developed in the eastern area of the faulted depression. Second, due to the influence of beach facies superimposed with dissolution, a porous dolomite reservoir is developed in the First Member of Canglangpu Formation. It is lithologically dominated by residual oolitic dolomite, doloarenite and powder crystalline dolomite, limy dolomite and dolomitic oolitic limestone. The main types of reservoir space are intergranular dissolved pores, intercrystalline dissolved pores and intercrystalline pores, with an average porosity of 4.1%. Third, according to the seismic data, multiple large-sized beach bodies are developed in the First Member of Canglangpu Formation in the central-northern Sichuan Basin, and they are laterally under the barrier of inter-beach tight lithology and vertically sealed by argillaceous rocks of the Second Member of Canglangpu Formation. Thus, the conditions for the formation of structural-lithologic traps are satisfied under the background of current anticline and the favorable exploration area is 3 200 km2. Fourth, the beach facies reservoir of the First Member of Canglangpu Formation immediately overlies the quality source rocks of Qiongzhusi Formation, so as to form a source rock-reservoir assemblage with source rocks in the lower part and the reservoir in the upper part. The Penglai-Shehong-Langzhong area is close to the Cambrian hydrocarbon generation center of Deyang-Anyue faulted depression, where hydrocarbon accumulation conditions are favorable. In conclusion, the first strategic breakthrough of oil and gas exploration in the Canglangpu Formation in Well Jiaotan 1 proves the greater oil and gas exploration potential in the Cambrian of the Sichuan Basin. The research results are of great significance to promoting the oil and gas exploration in Ordovician, Cambrian Gaotai Formation and Xixiangchi Formation and other emerging fields and strata of the Sichuan Basin.
Number of references: 22
Main heading: Petroleum prospecting
Controlled terms: Beaches - Flow of gases - Gases - Geological surveys - Hydrocarbons - Lime - Lithology - Natural gas well production - Natural gas wells - Natural gasoline plants - Petroleum geology - Petroleum reservoirs - Rocks - Seismology - Textures - Wildcat wells
Uncontrolled terms: Geological background - Geological conditions - Hydrocarbon accumulation - Hydrocarbon generation - Intercrystalline pores - Natural gas exploration - Oil and gas exploration - Oil and gas exploration potential
Classification code: 407.3 Coastal Engineering - 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 512 Petroleum and Related Deposits - 513.2 Petroleum Refineries - 631.1.2 Gas Dynamics - 804.1 Organic Compounds - 804.2 Inorganic Compounds
Numerical data indexing: Area 3.20e+09m2, Percentage 4.10e+00%
DOI: 10.3787/j.issn.1000-0976.2020.11.002

Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

116. Determination of secondary shoulder clearance of double-shoulder tool joints suitable for extra-deep wells

Accession number: 20203509114386
Title of translation:
Authors: Chen, Feng (1); Zhu, Wei (1); Di, Qinfeng (2); Wang, Wenchang (2); Chen, Wei (2); Wang, Nan (2)
Author affiliation: (1) School of Mechatronics Engineering and Automation, Shanghai University, Shanghai; 200072, China; (2) Shanghai Institute of Applied Mathematics and Mechanics, School of Mechanics and Engineering Science, Shanghai University, Shanghai; 200072, China
Corresponding author: Di, Qinfeng(qinfengd@sina.com)
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Publication year: 2020
Pages: 90-96
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to meet the requirements of more and more severe drilling conditions, the major drilling tool manufacturers all over the world continuously develop special thread tool joints with premium performance. In general, the structure of secondary shoulder is adopted to form a double-shoulder tool joint. However, it has not been concerned whether the secondary shoulder clearance of the existing tool joints can meet the requirements of the complex working conditions of ultra-deep wells and extra-deep wells. In this paper, a three-dimensional elastoplastic finite element model of a double-shoulder tool joint with different secondary shoulder clearances was established. Then, the influence of secondary shoulder clearance on the stress distribution and torsion performance of tool joints was analyzed. Finally, the secondary shoulder clearance of double-shoulder tool joints suitable for extra-deep wells was determined. And the following research results were obtained. First, under different axial loads (corresponding to different well depths), the secondary shoulder clearance has a great influence on the bearing ratio of primary shoulder, secondary shoulder and thread tooth of double-shoulder tool joints. Second, under the action of large axial force, the bearing capacity of primary shoulder and secondary shoulder are smaller while that of thread tooth is larger, and reducing the secondary shoulder clearance can effectively reduce the bearing ratio of thread tooth. Third, for the NC50 double-shoulder tool joint analyzed in this paper, it is suggested to set the secondary shoulder clearance at 0.40 mm when the axial force is less than 3 000 kN (well depth is less than 9 000 m). Fourth, it is suggested to set the secondary shoulder clearance at 0.20 mm when the axial force is more than 3 000 kN (well depth is over 9 000 m). In conclusion, selecting the double-shoulder tool joint with a rational secondary shoulder clearance according to well depth can effectively improve the application performance of joints and reduce failure risks. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 24
Main heading: Axial flow
Controlled terms: Infill drilling
Uncontrolled terms: Application performance - Axial forces - Bearing ratio - Drilling tool - Elastoplastic finite elements - Research results - Thread tooth - Ultra-deep wells
Classification code: 511.1 Oil Field Production Operations - 631.1 Fluid Flow, General
Numerical data indexing: Force 3.00e+06N, Size 2.00e-04m, Size 4.00e-04m, Size 9.00e+03m
DOI: 10.3787/j.issn.1000-0976.2020.07.011
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

117. Sedimentary facies and oil and gas exploration prospect of the Upper Triassic Baiguowan Formation in the Xichang Basin

Accession number: 20201708556795
Title of translation:
Authors: Yang, Wei (1); Wei, Guoqi (1); Jin, Hui (1); Hao, Cuiguo (1); Shen, Yuhong (1); Wang, Xiaodan (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 40
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Issue date: March 25, 2020
Publication year: 2020
Pages: 13-22
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The Xichang Basin is a potential area for oil and gas exploration in China, but the sedimentation of the Upper Triassic Baiguowan Formation in this basin is less understood and no significant breakthrough has been made in its oil and gas exploration. In order to speed up the oil and gas exploration of the Baiguowan Formation in the Xichang Basin, this paper systematically studied the types and characteristics of sedimentary facies, the sedimentary systems and the distribution of sand bodies of the Baiguowan Formation in the Xichang Basin based on the outcrop, drilling and analysis assay data of Upper Triassic in the Xichang Basin and the Sichuan basin. Then, its relationship with the Xujiahe Formation of Upper Triassic in the Sichuan Basin was discussed, and its oil and gas exploration prospect was evaluated. And the following research results were obtained. First, the Baiguowan Formation in the Xichang Basin is mainly composed of sandstone and mudstone, which can be divided into four lithologic sections, corresponding to the third to sixth members of Xujiahe Formation in the Sichuan Basin, and sandstone is developed in the second Member of Baiguowan Formation. Second, there are mainly three types of sedimentary systems in the Baiguowan Formation, including fan delta, river delta and lake. In the basin, lakes and river deltas are dominant and delta front sand bodies and bar sand bodies are developed. Third, during the sedimentation of Baiguowan Formation, the Xichang Basin and the Sichuan Basin were a whole with the same sedimentary system and the basically accordant structural evolution, and the water body mainly flowed from the Sichuan Basin to the Xichang Basin. Fourth, the argillaceous source rocks of Baiguowan Formation are thick with good hydrocarbon generation potential. The sand bodies of delta front and the bar sand bodies in lakes have certain reservoir capacity. It is concluded that the Baiguowan Formation in the Xichang Basin has a good prospect of natural gas exploration because of its source-reservoir integration, large area superimposition and good source-reservoir allocation. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 21
Main heading: Petroleum prospecting
Controlled terms: Gases - Geological surveys - Lakes - Sand - Sandstone - Sedimentology
Uncontrolled terms: Hydrocarbon generation potential - Natural gas exploration - Oil and gas exploration - Reservoir capacity - Sedimentary facies - Sedimentary systems - Structural evolution - Xujiahe formation
Classification code: 481.1 Geology - 482.2 Minerals - 483.1 Soils and Soil Mechanics - 512.1.2 Petroleum Deposits : Development Operations
DOI: 10.3787/j.issn.1000-0976.2020.03.002
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

118. A logical growth model considering the influence of shale gas reservoirs and development characteristics

Accession number: 20202308799566
Title of translation:
Authors: Zhao, Qun (1, 2); Wang, Hongyan (1, 2); Sun, Qinping (1, 2); Jiang, Xinchun (1, 2); Yu, Rongze (1, 2); Kang, Lixia (1, 2); Wang, Xuefan (1, 2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) National Energy Shale Gas R & D Center, Langfang; Hebei; 065007, China
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Abbreviated source title: Natur. Gas Ind.
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Pages: 77-84
Language: Chinese
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: As shale gas development is advancing continuously and rapidly, how to deeply analyze the production performance of shale gas wells and evaluate their production characteristics has become an urgent problem in the evaluation of shale gas productivity construction zone, the formulation of new area development scheme and the preparation of planning program. Some scholars have applied the logical growth model (LGM model) in the production decline analysis of unconventional gas wells, but the influences of shale gas reservoir and development characteristics are not taken into consideration. Therefore, this method still has some space of further development and improvement. In this paper, a logistic growth model considering shale gas reservoirs and development characteristics (RB-LGM model) was established based on the previous research results. Then, it was applied to the shale gas development wells in the Changning Block of the Sichuan Basin to analyze their production performance, and the analysis results were compared with the fitting and prediction results provided by Arps hyperbolic decline model. Finally, the optimal well spacing of horizontal wells was determined using the RB-LGM model. And the following research results were obtained. First, shale gas is produced by deploying horizontal wells in the clustered pattern in a large number, so on the basis of the LGM model, RB-LGM model takes shale gas reservoir parameters (thickness, shale density, gas content) and development parameters (horizontal section length, well spacing and recovery factor) as the logic control factors of horizontal- well gas production fitting, so that the production prediction result of gas well is more reasonable. Second, the RB-LGM model can not only well fit the early production data of gas well, but ensure the convergence of the later prediction results under the control of logical conditions. Third, the RB-LGM model takes into account the influence of shale gas reservoir and development characteristics so as to optimize the horizontal well pattern and analyze the change trend of reservoir parameters in the development area through data inversion.
Number of references: 28
Main heading: Well spacing
Controlled terms: Density of gases - Forecasting - Gas industry - Gases - Horizontal wells - Natural gas well production - Natural gas wells - Petroleum reservoir evaluation - Petroleum reservoirs - Shale gas
Uncontrolled terms: Development characteristics - Logistic growth model - Production characteristics - Production decline analysis - Production performance - Production prediction - Reservoir parameters - Shale gas reservoirs
Classification code: 512 Petroleum and Related Deposits - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids
DOI: 10.3787/j.issn.1000-0976.2020.04.009
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

119. Working performance of a nylon-cord packer rubber cylinder and its influencing factors

Accession number: 20200908220980
Title of translation:
Authors: Wang, Hanxiang (1); Zhang, Yanwen (1); Che, Jiaqi (1); Liu, Yanxin (1); Lan, Wenjian (1); Du, Mingchao (1)
Author affiliation: (1) College of Electromechanical Engineering, China University of Petroleum , Dongying; Shandong; 257061, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue: 1
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Publication year: 2020

Pages: 97-103
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Although a nylon-cord packer rubber cylinder is suitable for open-hole well conditions with small wellbore, irregular wall and high formation pressure, it is disadvantageous with low pressure bearing capacity and poor sealing performance. In order to improve the working performance of a nylon-cord rubber cylinder, it is necessary to clarify the material parameters of the rubber cylinder and cord on the basis of tensile test and Gough-Tangorra theory. A three-dimensional numerical simulation model for a nylon-cord rubber cylinder was established, and its accuracy was verified based on laboratory tests. Besides, the change laws of the stress and contact stress of nylon-cord rubber cylinder under different setting pressures were studied, and the effects of cord angle, cord layer amount and cord spacing on the pressure bearing capacity and sealing performance of the packer rubber cylinder were analyzed systematically. And the following research results were obtained. First, the maximum setting pressure, maximum working pressure and residual deformation of nylon-cord rubber cylinder measured in the tests are 70 MPa, 50 MPa and 3.2%, respectively. Second, the three-dimensional numerical simulation model for nylon-cord rubber cylinder is established based on REFINE 265 unit, and the error between the simulation result and the test result is about 15%, which can satisfy the needs of engineering analysis. Third, with the increase of the cord angle from 14° to 20°, the cord stress increases linearly and the rubber stress and contact stress decrease slightly. Fourth, as the number of cord layers increases from 2 to 8, the rubber stress and contact stress decrease significantly, and the decrease rate of the cord stress increases with the highest decrease amplitude up to 64%. Fifth, with the increase of cord spacing from 1.4 mm to 2 mm, the rubber stress and cord stress increase synchronously and the contact stress decreases. In conclusion, the research results provide a theoretical basis for improving the working performance of nylon-cord rubber cylinder.
Number of references: 21
Main heading: Seals
Controlled terms: Bearing capacity - Bearings (machine parts) - Computer simulation - Cylinders (shapes) - Numerical models - Packers - Polyamides - Rayon - Rubber - Tensile testing
Uncontrolled terms: Contact Stress - Engineering analysis - Laboratory test - Pressure bearing capacity - Residual deformation - Rubber stress - Three-dimensional numerical simulations - Working performance
Classification code: 511.2 Oil Field Equipment - 601.2 Machine Components - 619.1.1 Pipe Accessories - 723.5 Computer Applications - 815.1.1 Organic Polymers - 818.1 Natural Rubber - 819.2 Synthetic Fibers - 921 Mathematics
Numerical data indexing: Percentage 1.50e+01%, Percentage 3.20e+00%, Percentage 6.40e+01%, Pressure 5.00e+07Pa, Pressure 7.00e+07Pa, Size 1.40e-06m2 to 2.00e-03m2
DOI: 10.3787/j.issn.1000-0976.2020.01.013
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

120. An annulus pressure prediction model for deepwater oil & gas wells during unsteady-state testing

Accession number: 20210309770858
Title of translation:
Authors: Zhang, Zhi (1); Xiang, Shilin (1); Feng, Xiaoxiao (1); Liu, Hexing (2); Meng, Wenbo (2); Li, Yanjun (2); Ma, Chuanhua (2)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; 610500, China; (2) CNOOC China Limited Zhanjiang Company, Zhanjiang; 524057, China
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ISSN: 10000976
CODEN: TIGOE3

Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to solve the problem of wellbore integrity damage due to annulus pressure increase during deepwater oil & gas well testing, this paper established a wellbore unsteady-state heat transfer model for the short-term unsteady state process of gas well testing. Then, the annulus pressure prediction model considering the nonlinear change of fluid properties was established according to the functional relationship between the isobaric expansion coefficient, isothermal compression coefficient and density. Finally, the established model was applied to predict the annulus temperature and pressure under different testing systems by taking a certain deepwater high temperature and high pressure (HTHP) gas well in the western South China Sea as an example. In addition, the strength of the wellbore string was checked according to the minimum safety factor. And based on this, the maximum allowable pressure of each annulus in the wellbore was determined, and the safety diagnosis chart under different testing systems was plotted. And the following research results were obtained. First, with the increase of testing production rate and testing time, the annulus temperature increases, but the temperature difference between the wellhead and the bottom hole decreases. At the same testing production rate and testing time, the temperature of annulus 2 is always higher than that of annulus 3, and their temperature difference is larger. Second, with the increase of testing production rate and testing time, the pressure of annulus 2 and 3 increase, but the rising trend slows down. The pressure of annulus 2 is higher than that of annulus 3 at the same testing production rate and testing time. Third, if the influence of the nonlinear change of fluid property is not taken into consideration, the annulus pressure will be underestimated, and the relative error will increase continuously with the increase of testing production rate and testing time. Fourth, with the increase of testing production rate and testing time, the pressure of annulus 2 will first exceed the maximum allowable annulus pressure. Therefore, during the testing operation of the deepwater HTHP well, more attention shall be paid to the pressure change of annulus 2 under different testing systems. In conclusion, the proposed safety diagnosis chart can conveniently and quickly judge whether the testing system of a deepwater gas well is designed reasonably, so as to ensure the wellbore integrity in the testing process to the maximum.
Number of references: 24
Main heading: Oil well testing
Controlled terms: Boreholes - Forecasting - Gases - Heat transfer - Offshore gas well production - Offshore gas wells - Oil field equipment - Oil wells - Predictive analytics - Safety factor - Safety testing
Uncontrolled terms: Functional relationship - High temperature and high pressures (HTHP) - Isobaric expansion coefficients - Isothermal compressions - Temperature and pressures - Temperature differences - Unsteady-state heat transfer - Western south china seas
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 641.2 Heat Transfer - 914.1 Accidents and Accident Prevention
DOI: 10.3787/j.issn.1000-0976.2020.12.009
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

121. Genesis and geological implications of large-scale microbialite reservoirs in the Tianjingshan paleouplift of the northwestern Sichuan Basin

Accession number: 20205009619736
Title of translation:
Authors: Xin, Yongguang (1, 2); Wang, Xingzhi (1); Tang, Qingsong (3); Tian, Han (2); Zhang, Hao (2); Xu, Liang (3); Feng, Qingfu (2); Yin, Hong (4); Wang, Xuli (4)
Author affiliation: (1) Southwest Petroleum University, Chengdu; 610500, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (3) PetroChina Southwest Oil & Gasfield Company, Chengdu; 610051, China; (4) Northwest Sichuan Division, PetroChina Southwest Oil & Gasfield Company, Jiangyou; 621741, China
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Document type: Journal article (JA)
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Abstract: A thick microbialite reservoir is developed in the Leikoupo Formation of Middle Triassic in Jiangyou-Jiange area of the northwestern Sichuan Basin. However, its geological background of reservoir development is not determined clearly, and the main control factors are not understood definitely. In order to determine the large-scale reservoir development area and guide natural gas exploration and development, this paper analyzed the characteristics and genesis of the microbialite reservoir in the third sub-member of the third Member of Leikoupo Formation (Lei33 sub-member) in the south section of Tianjingshan paleouplift in the northwestern Sichuan Basin and evaluated the control action of Tianjingshan paleouplift on the large-scale formation of microbialite reservoirs, based on outcrops, drilling cores and test data. And the following research results were obtained. First, the Lei33 sub-member microbialite reservoirs in the area of Tianjingshan paleouplift is lithologically composed of algal debris dolomite and algal laminar dolomite. The reservoir space is dominated by dissolved pores between algal binding grids, intergranular dissolved pores, intragranular dissolved pores, bird's eye pores, intercrystalline dissolved pores and fractures. Second, in the paleouplift area develops a large-scale microbialite reservoir, with a thickness of 20-70 m and an area of about 1×104 km2. Third, the main reason for the development of large-scale reservoirs in the paleouplift is that there are favorable conditions for the development of microbialite, penesyngenetic karstification and supergene karstification in this area. In conclusion, the Tianjingshan paleouplift area has favorable conditions for the development of microbialite reservoirs and the formation of large-scale reservoirs, so it shall be regarded as a favorable area for natural gas exploration of Leikoupo Formation in the Sichuan Basin. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 20
Main heading: Petroleum prospecting
Controlled terms: Dissolution - Geological surveys - Geology - Natural gas - Textures
Uncontrolled terms: Favorable conditions - Geological background - Intercrystalline - Main control factor - Natural gas exploration - Pores and fractures - Research results - Reservoir development
Classification code: 481.1 Geology - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 802.3 Chemical Operations
Numerical data indexing: Size 2.00e+01m to 7.00e+01m
DOI: 10.3787/j.issn.1000-0976.2020.09.003
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

122. An internal structure anatomy method for braided-river sandstone reservoirs and its application in the Sulige Gas Field of the Ordos Basin

Accession number: 20202308799551
Title of translation: -
Authors: Li, Zhuzheng (1); Li, Kaijian (1); Li, Bo (1); Wang, Jiahui (1); Zhong, Jinyin (1); Wang, Haifeng (1); Yao, Wujun (1)
Author affiliation: (1) Geological Exploration & Development Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China
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Pages: 30-39
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: The lower submember of the 8th Member of Middle Permian Shihezi Formation in the northern Sulige Gas Field of the Ordos Basin (hereinafter, "He 8 lower submember" for short) is classified as braided river deposit in the delta plain subfacies of braided river. This gas reservoir is a rare tight sandstone reservoir of low permeability, low formation pressure and low abundance, with complex distribution rules of effective sand bodies and low drilling

rate of effective reservoirs in horizontal wells. In order to figure out the distribution rules of effective sand bodies, this paper precisely characterized the internal structures of thick sandstone in terms of single braided channel, composite diara, single diara and diara internal structure, based on modern sedimentation and outcrop, with the focus on the infill well blocks and the composite diara as the main research object. Then, multi-level quantitative recognition and internal structure anatomy method was established, and the internal structures of the thick sandstone in this area were described elaborately. Finally, the gas bearing property was analyzed. And the following research results were obtained. First, the single braided channel of He 8 lower submember in this area is 600-3 500 m wide, the composite diara is 1 500-2 500 m long and 800-1 400 m wide, and the single diara is 1 000-1 750 m long and 300-1 050 m wide. Three or four accretion sand bodies are generally developed in a diara. Second, the effective sand bodies of He 8 lower submember are mainly controlled by the distribution of diaras. They are vertically in a "lenticular" distribution pattern due to the barrier of bedding interbeds, and areally in an "isolated island" distribution pattern. Third, gas bearing property is good in the water face of the diara, moderate in the central position and poor in the back surface. In conclusion, this proposed multi-level internal structure anatomy method for braided-river thick sandstone reservoir can establish the enrichment model of effective sand body and provide fine geological basis for the optimal design of horizontal wells and the technical support for the efficient development of horizontal wells in the Sulige Gas Field.
Number of references: 21
Main heading: Low permeability reservoirs
Controlled terms: Gas bearings - Gases - Helium - Horizontal wells - Infill drilling - Metamorphic rocks - Petroleum reservoir engineering - Rivers - Sand - Sandstone
Uncontrolled terms: Bearing properties - Distribution patterns - Effective reservoir - Enrichment models - Internal structure - Low formation pressure - Sandstone reservoirs - Tight sandstone reservoirs
Classification code: 482.2 Minerals - 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 601.2 Machine Components - 804 Chemical Products Generally
Numerical data indexing: Size 1.00e+03m to 1.75e+03m, Size 1.50e+03m to 2.50e+03m, Size 3.00e+02m to 1.05e+03m, Size 6.00e+02m to 3.50e+03m, Size 8.00e+02m to 1.40e+03m
DOI: 10.3787/j.issn.1000-0976.2020.04.004
Compendex references: YES
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123. Feasibility of extended drilling of aluminum alloy drill pipes in long horizontal wells

Accession number: 20200908220998
Title of translation:
Authors: Zhu, Xiaohua (1); Li, Ke (1)
Author affiliation: (1) College of Electromechanic Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China
Source title: Natural Gas Industry
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: At present, the key research on shale gas well drilling in China targets the long horizontal wells with vertical depth over 4 000 m. Long horizontal drill string requires the drill pipe to transmit greater axial force to resist the friction along the string. And the adoption of light aluminum alloy drill pipe is a revolutionary technology of extended drilling with greater implementation feasibility, but its friction torque characteristics, weight on bit (WOB) transfer laws, buckling characteristics, safety & reliability and other problems have not been studied systematically. In this regard, a dynamic model of multi-dimension aluminum alloy drill string according to the principle of Hamilton was established. Then, the model was solved using the HHT-α method. Finally, the contact friction, WOB transfer laws and influencing factors of aluminum alloy drilling tools were compared with those of steel drilling tools. And the following research results were obtained. First, the pressure loss of the aluminum alloy drill pipe is obviously lower than that of steel drill pipe. Second, aluminum alloy is softer, so small-sized aluminum alloy drill pipe is prone to buckling in the process of drilling, which

leads to the reduction of WOB transfer efficiency and even the occurrence of "self-locking drill pipe" phenomenon. Third, the large-sized aluminum alloy drill pipe is smaller in buckling deformation and it is superior to the small-sized aluminum alloy drill pipe in terms of friction drag reduction effect. The friction drag of the OD 147 mm aluminum alloy drill pipe is only 71.9% that of the OD 129 mm aluminum alloy drill pipe. In conclusion, the rigidity of small-sized aluminum alloy drill pipes cannot satisfy the strict drilling conditions of shale gas wells with long horizontal sections, and large-sized aluminum alloy drill pipes are one of the important prerequisites for solving the difficulty of extended drilling.
Number of references: 25
Main heading: Aluminum alloys
Controlled terms: Aluminum coated steel - Buckling - Drag - Drill pipe - Drill strings - Drills - Dynamics - Friction - Horizontal drilling - Horizontal wells - Infill drilling - Natural gas wells - Shale gas - Well drilling
Uncontrolled terms: Buckling deformation - Friction drag - Friction drag reductions - Long horizontal wells - Pressure loss - Revolutionary technology - Transfer efficiency - WOB transfer
Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 541.1 Aluminum - 541.2 Aluminum Alloys - 603.2 Machine Tool Accessories
Numerical data indexing: Percentage 7.19e+01%, Size 1.29e-01m, Size 1.47e-01m, Size 4.00e+03m
DOI: 10.3787/j.issn.1000-0976.2020.01.012
Compendex references: YES
Database: Compendex

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124. Application of electric drive fracturing equipment in shale gas reservoir stimulation

Accession number: 20202508844967
Title of translation:
Authors: Zhang, Bin (1, 2); Li, Lei (1, 3); Qiu, Yongchao (4); Dai, Qiping (1, 2); Li, Shuangpeng (1, 2); Deng, Youchao (5)
Author affiliation: (1) CNPC Baoji Oilfield Machinery Co., Ltd., Baoji; Shaanxi; 721002, China; (2) National Engineering Research Center of Oil and Gas Drilling Equipment, Baoji; Shaanxi; 721002, China; (3) Southwest Jiaotong University, Chengdu; Sichuan; 610031, China; (4) CNPC Chuanqing Drilling Engineering Co. Ltd., Chengdu; Sichuan; 610051, China; (5) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China
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Language: Chinese
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Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: Fracturing equipment is the core device in shale gas reservoir stimulation. As domestic shale gas exploration and development steps into deep layers, the development of fracturing technology puts forward higher requirements for relevant equipment. Electric drive is an important development direction of fracturing equipment technology. In this paper, the technical progress of electric drive fracturing equipment in China and abroad was investigated. It is shown that a high-power frequency conversion system is the key technology to determine the performance of electric drive fracturing equipment. After the adaptability of the high-power frequency conversion technology to electric fracturing equipment was analyzed, based on the fracturing operation of Model 2500 electric drive fracturing trucks in the Weiyuan Block of the Sichuan Basin for shale gas reservoir stimulation, electric drive and diesel-driven fracturing equipments were comparatively analyzed from the aspects of economical and technical indicators. And the following research results were obtained. First, compared with a diesel-driven fracturing truck of the same power, an electric drive fracturing truck can realize a full power coverage and a continuous adjustment of output displacement, and can better meet the operation requirements of fracturing process for a precise control of the pumping displacement, while reducing the power cost by 68% and the equipment purchase cost by 10-20%. Second, compared with the skid mounted equipment, an electric drive fracturing truck has a better transport performance, being suitable for the fracturing well sites with poor road conditions, such as loess gullies, hills and mountains. It is suggested that the following development direction of the electric drive fracturing equipment should focus on the improvement

of single machine power density. In addition, it is recommended to enhance the basic studies on high-pressure and high-power semiconductor devices and make a good plan for the power demand of shale gas platform construction in advance, so as to give a better play to the operating cost advantage of electric drive fracturing equipments.
Number of references: 18
Main heading: Electric drives
Controlled terms: Construction equipment - Diesel engines - Electric control equipment - Fracture - Gases - Geological surveys - Petroleum prospecting - Petroleum reservoirs - Semiconductor devices - Shale gas - Truck transportation - Trucks
Uncontrolled terms: Development directions - Equipment technology - Fracturing operations - High-power semiconductor devices - Pumping displacements - Shale gas reservoirs - Technical indicator - Transport performance
Classification code: 405.1 Construction Equipment - 432.3 Cargo Highway Transportation - 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 612.2 Diesel Engines - 663.1 Heavy Duty Motor Vehicles - 704.2 Electric Equipment - 714.2 Semiconductor Devices and Integrated Circuits - 951 Materials Science
Numerical data indexing: Percentage 1.00e+01% to 2.00e+01%, Percentage 6.80e+01%
DOI: 10.3787/j.issn.1000-0976.2020.05.006
Compendex references: YES
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125. A new method for calculating apparent formation dips based on strata rotation

Accession number: 20202908937806
Title of translation: -
Authors: Xie, Fei (1); Wang, Yun (1); Mei, Junwei (1); Chen, Zhenlong (1)
Author affiliation: (1) Research Institute of Exploration and Development, Sinopec East China Branch, Nanjing; Jiangsu; 210011, China
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Publication year: 2020
Pages: 61-68
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: With the gradual deepening of shale gas exploration and development and increasing development scale, horizontal well geosteering technologies will be highly required to achieve more accurate geological guidance with the adjustment of drilling trajectory so as to make the horizontal track pass through high-quality reservoir sections. In this regard, a new method for calculating apparent formation dips was proposed, which revolves the strata in a three-dimensional space and takes the highest matching degree of feature points on the logging curves as the principle, and it was applied to the geosteering of horizontal wells. Based on the principle of equal thickness correlation, by this new method the calculation of apparent formation dips is transformed into a global optimization process, and a two-stage method suitable for this new method was also introduced. Compared with those conventional methods, this new method has the following advantages. First, in the case of large-angle torsional orientation and unknown formation dips before the target enters, the apparent formation dips of horizontal sections can be calculated accurately, so can be both stratigraphic tendencies and true dips at the same time. Second, if the vertical thickness of a horizontal well is quite different from that of a selected standard well, and the true thickness of the strata is unknown, the apparent formation dips can be calculated stably and effectively. The tested results from field practices demonstrate that the introduced two-stage method can accurately calculate the comprehensive stratigraphic tendency under the condition of large angle torsion orientation, and the apparent formation dips in the horizontal sections, which is consistent with the actual data. In conclusion, this new method is more suitable especially for the case that the difference of vertical formation thickness is great due to the variation of true formation dips.
Number of references: 18

Main heading: Horizontal wells
Controlled terms: Geological surveys - Global optimization - Petroleum prospecting - Stratigraphy - Tunneling (excavation)
Uncontrolled terms: Conventional methods - Gas exploration - High quality reservoir - Horizontal section - Matching degree - Three dimensional space - Torsional orientation - Two-stage methods
Classification code: 401.2 Tunnels and Tunneling - 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 921.5 Optimization Techniques
DOI: 10.3787/j.issn.1000-0976.2020.06.006
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

126. New breakthrough of natural gas exploration in the Qixia Formation of Middle Permian by Well Pingtan 1 in the southwestern Sichuan Basin and its implications

Accession number: 20203509114420
Title of translation: 1
Authors: Zhang, Benjian (1); Yin, Hong (1); Li, Rongrong (1); Xie, Chen (2); Wang, Xiaoxing (3); Pei, Senqi (1); Hu, Xin (1); Yang, Hua (1); Deng, Bo (1); Chen, Xiao (2); Li, Xucheng (1)
Author affiliation: (1) Northwest Sichuan Division, PetroChina Southwest Oil & Gasfield Company, Jiangyou; Sichuan; 621741, China; (2) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (3) Exploration Department, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China
Source title: Natural Gas Industry
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In 2020, Well Pingtan 1 in the southwestern Sichuan Basin drills into porous dolomite reservoirs of marginal platform belt in the Qixia Formation of Middle Permian and produces high-yield industrial gas, which indicates a new breakthrough of Middle Permian natural gas exploration in this area. In order to further understand the geological conditions of Qixia Formation and provide guidance for the natural gas exploration in this area, this paper studied hydrocarbon accumulation elements of this area (e.g. hydrocarbon source conditions, reservoir characteristics and preservation conditions) after analyzing the drilling results of Well Pingtan 1. Then, exploration potential and direction of Qixia Formation natural gas in this area were discussed. And the following research results were obtained. First, the Qixia Formation reservoirs in the southwestern Sichuan Basin are dominated by moderate and fine crystalline dolomite, and their reservoir spaces are mainly acted by dissolved vugs, intercrystalline pores, intergranular pores and fractures. They are frac-tured-porous reservoirs of low porosity and middle-low permeability, with locally developed high-porosity and high-permeability reservoirs. Their lateral distri-bution is controlled by marginal platform shoal and they are extensively distributed in the area of Qiongxi, Pingluoba, Mingshan and Hanwangchang. Second, the source rocks of Qixia Formation natural gas in this area are similar to those in Shuangyushi structure, and they are mainly composed of mud shale of Lower Cambrian Qiongzhusi Formation and marl of Middle Permian, among which the Qiongzhusi Formation is dominant. Third, this area is characterized by "double-layer structure" vertically, and the Triassic salt gypsum has regional sealing conditions and the Permian structural traps and structural-lithological traps are morphologically completed with good pre-servation conditions, which provide favorable sites for the accumulation of Qixia Formation natural gas. In conclusion, the Middle Permian in the southwestern Sichuan Basin is better in hydrocarbon accumulation conditions, and the breakthrough of Well Pingtan 1 reveals a good natural gas exploration potential of Qixia Formation dolomite reservoirs of marginal platform belt in the southwestern Sichuan Basin.
Number of references: 19
Main heading: Petroleum prospecting

Controlled terms: Crystallography - Fertilizers - Gases - Geological surveys - Hydrocarbons - Infill drilling - Lithology - Low permeability reservoirs - Natural gas - Natural gas well drilling - Natural gas wells - Petroleum reservoir engineering - Porosity - Textures
Uncontrolled terms: Double layer structure - Exploration potential - High permeability reservoirs - Hydrocarbon accumulation - Intercrystalline pores - Natural gas exploration - Preservation condition - Reservoir characteristic
Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 804 Chemical Products Generally - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids - 933.1 Crystalline Solids
DOI: 10.3787/j.issn.1000-0976.2020.07.004
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

127. Tectonic-lithofacies paleogeographic characteristics of Cambrian-Ordovician deep marine carbonate rocks in the Ordos Basin

Accession number: 20201208317944
Title of translation: --
Authors: Zhou, Jingao (1, 2); Xi, Shengli (3); Deng, Hongying (1); Yu, Zhou (1); Liu, Xinshe (3); Ding, Zhenchun (1); Li, Weiling (1); Tang, Jin (4)
Author affiliation: (1) PetroChina Hangzhou Research Institute of Geology, Hangzhou; Zhejiang; 310023, China; (2) CNPC Key Laboratory of Carbonate Reservoir, Hangzhou; Zhejiang; 310023, China; (3) PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (4) China University of Petroleum, Beijing, Beijing; 102249, China
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Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: For many years, research achievements on the tectonic-lithofacies paleogeography of marine carbonate rock have been playing an important role in the deployment of oil and gas exploration in the Ordos Basin. Due to limited data and cognitions, however, the existing sedimentary facies maps cannot meet the demand of exploration and development of deep marine carbonate oil and gas reservoirs in the Ordos Basin. After investigating the palaeogeomorphological setting of the Ordos Basin, this paper analyzed the paleogeographic characteristics of Middle Cambrian Zhangxia Formation and Lower Ordovician Majiagou Formation by plotting its tectonic-lithofacies paleogeography map, based on new well drilling and seismic data, combined with lithofacies identification techniques. Then, the sedimentary models of two periods were established and the controlling effect of paleogeography on reservoir development and distribution was researched. And the following research results were obtained. First, during the deposition of Zhangxia Formation, the paleogeographic setting was in the pattern of "three uplifts and four depressions", which extended in the northeast direction under the effect of the Pre-Sinian rift. The depressions evolved into deep-water bays or intra-platform lows, the uplifts evolved into carbonate platforms, and the oolitic shoals developed around uplift-depression transition zones and paleo-uplifts. And they constitute the favorable reservoir facies belt in the Zhangxia Formation. Second, the paleogeographic pattern during the deposition of the Majiagou Formation was "three uplifts, two sags and one salient", and it mainly extended along north and south. Paleo-uplifts acted as important barriers. In the transgression stage, shoals and flats developed around the paleo-uplifts and depressions evolved into lagoons. In the regression stage, paleo-uplifts got exposed and depressions evolved into gypsum salt lakes. Gypsum and dolomite flat became a favorable reservoir facies zone and lagoon became an important place for cap rock development. Third, tectonic-lithofacies paleogeography controls reservoirs sedimentary setting and material bases and has important influence on the reconstruction scope and the degree of early dolomitization and karstification, so as to control the macro-distribution of favorable reservoirs. Fourth, the sedimentary models of the rimmed platform in the Zhangxia Formation and the barrier platform in the Majiagou Formation reveal that there are three potential plays in the Zhangxia Formation and two plays in the Majiagou Formation. In conclusion, the weathered crust in the Zhangxia Formation, the weathered crust in the upper plays of Majiagou Formation and the grain beach in

the middle-lower plays of Majiagou Formation are the favorable oil and gas exploration directions in the Ordos Basin.
Number of references: 56
Main heading: Petroleum prospecting
Controlled terms: Carbonates - Carbonation - Deposition - Geological surveys - Gypsum - Metamorphic rocks - Offshore gas fields - Petroleum reservoir engineering - Petroleum reservoirs - Sedimentary rocks - Sedimentology - Seismology - Tectonics - Well drilling
Uncontrolled terms: Cambrians - Deep-marine - Lithofacies - Oil and gas exploration - Ordos Basin - Ordovician - Reservoir distribution - Sedimentary models
Classification code: 481.1 Geology - 482.2 Minerals - 484.1 Earthquake Measurements and Analysis - 512 Petroleum and Related Deposits - 802.2 Chemical Reactions - 802.3 Chemical Operations - 804.2 Inorganic Compounds
DOI: 10.3787/j.issn.1000-0976.2020.02.005
Compendex references: YES
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128. Risk evaluation technology for safe casing running in long horizontal shale gas wells

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Title of translation:
Authors: Li, Wenzhe (1); Wen, Qianbin (2); Xiao, Xinyu (2); Tang, Liang (3); Feng, Wei (2); Li, Qian (2); Liu, Sujun (3)
Author affiliation: (1) Sichuan Changning Natural Gas Development Co. Ltd., Chengdu; 610056, China; (2) Intercontinental Strait Energy Technology Co. Ltd., Chengdu; 610056, China; (3) Drilling & Production Technology Research Institute, CNPC Chuanqing Engineering Co., Lid., Deyang; 618300, China
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ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the Changning Block of Changning-Weiyuan National Shale Gas Demonstration Area in the Sichuan Basin, the shale-gas cluster horizontal section is 1 200-2 800 m long, and the lateral distribution of high-quality reservoirs is heterogeneous, so the trajectory of horizontal sections is adjusted frequently, and the wellbore stability in target layers is poor with severe lost circulation, hole shrinkage and collapse. As a result, 80-90% of the horizontal wells undergo the difficulty of casing running, and even the casing in some of them cannot run to the expected depth, which causes huge economic loss. Based on actual measurement data of casing running in the shale-gas horizontal wells of the Changning Block, this paper analyzed centralizer, hole curvature, well deviation, well diameter, friction coefficient and other key factors by making comprehensive use of the modified 3D soft string friction calculation model and the data statistical analysis method. Accordingly, one new method for comprehensively evaluating the risks of casing running in a long horizontal section was proposed. And the following research results were obtained. First, compared with the hole curvature, the cumulative hole curvature can reflect the influence degree of the casing running friction more objectively. When the cumulative hole curvature is greater than 170°/m, the casing running friction begins to increase rapidly. Therefore, as for the horizontal wells with greater hole curvature, it is necessary to avoid frequent trajectory adjustment, so as to reduce the difficulty of casing running. Second, the variation coefficient of well diameter can accurately describe the variation range of well diameter in the direction of the horizontal wellbore. As for the horizontal wells with complex geological conditions, hole shrinkage and severe collapse, the prediction accuracy can be improved effectively by evaluating the influence of casing running friction based on the statistical analysis of the variation coefficient of well diameter. When the variation coefficient of well diameter is less than 2%, the influence of casing running friction is less, otherwise, the influence is greater. In conclusion, the application results in 5 wells indicate that the evaluation result is basically accordant with the actual measurement data in the construction site, which proves this method can accurately evaluate the risks of casing running in long horizontal wells under complex reservoir conditions.
Number of references: 17

Main heading: Horizontal wells
Controlled terms: Boreholes - Friction - Losses - Oil field equipment - Petroleum reservoir evaluation - Risk assessment - Shale gas - Shrinkage - Statistical methods
Uncontrolled terms: Complex geological condition - Data statistical analysis - Friction coefficients - High quality reservoir - Lateral distributions - Long horizontal wells - Trajectory adjustments - Variation coefficient
Classification code: 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 911.2 Industrial Economics - 914.1 Accidents and Accident Prevention - 922.2 Mathematical Statistics - 951 Materials Science
Numerical data indexing: Percentage 2.00e+00%, Percentage 8.00e+01% to 9.00e+01%, Size 1.20e+03m to 2.80e+03m
DOI: 10.3787/j.issn.1000-0976.2020.09.012
Compendex references: YES
Database: Compendex

Data Provider: Engineering Village

129. Applicable conditions of the binomial pressure method and pressure-squared method for gas well deliverability evaluation

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Title of translation: ,
Authors: Sun, Hedong (1); Meng, Guangren (1); Cao, Wen (1); Su, Xiaobin (2); Liang, Zhidong (2); Zhang, Runjie (2); Zhu, Songbai (2); Wang, Shengjun (2)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China
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CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In order to quickly and accurately evaluate gas well deliverability, it is necessary to clarify the applicable conditions of the simplified laminar-inertial-turbulent gas well deliverability evaluation method (i.e., pressure-squared method and pressure method). In this regard, this paper analyzes the PVT data, simulation wells and field case wells of typical gas reservoirs in China by reviewing the formal evolution of the flow control equation for the real gases in porous media. Then, the applicable conditions of binomial pressure-squared method and pressure method are discussed. And the following research results were obtained. First, when the pressure is lower than 14 MPa, μZ is basically a constant; and when the pressure is higher than 42 MPa, is basically a constant. Second, the applicable range of the pressure-squared method can be increased from 14 to 20 MPa. In this case, the relative error of absolute open flow potential calculated using the pressure-squared method is less than 5% compared with the pseudo-pressure method. If the pressure is between 20 and 30 MPa, the relative error of the absolute open flow potential calculated using the pressure-squared method is less than 10%. Third, when the pressure exceeds 80 MPa, the relative error of the absolute open flow potential calculated using the pressure method is less than 10% compared with the pseudo-pressure method. If the pressure-squared method is used in the case of high pressure, the calculated absolute open flow potential is lower and the relative error is close to 25%. Fourth, in the case of low pressure, if the pressure is constant, the higher the temperature is, the smaller the relative error between the pressure-squared method and the pseudo-pressure method is. In the case of high pressure, if the pressure is constant, the higher the temperature is, the greater the relative error between the pressure method and the pseudo-pressure method. In conclusion, it is recommended to adopt the pseudo-pressure method in laminar-inertial-turbulent gas well deliverability analysis. In the case of low pressure (below 30 MPa), the pressure-squared method can be used. In the case of high pressure (above 80 MPa), the pressure method can be applied. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 18
Main heading: Petroleum reservoir evaluation
Controlled terms: Errors - Gases - Natural gas wells - Petroleum reservoirs - Porous materials

Uncontrolled terms: Applicable conditions - Deliverability - Gas well - High pressure - Low pressures - Pressure methods - Pseudo pressure
Classification code: 512 Petroleum and Related Deposits - 951 Materials Science
Numerical data indexing: Percentage 1.00e+01%, Percentage 2.50e+01%, Percentage 5.00e+00%, Pressure 1.40e+07Pa, Pressure 1.40e+07Pa to 2.00e+07Pa, Pressure 2.00e+07Pa to 3.00e+07Pa, Pressure 3.00e+07Pa, Pressure 4.20e+07Pa, Pressure 8.00e+07Pa
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130. Enrichment laws of deep tight sandstone gas reservoirs in the Western Sichuan Depression, Sichuan Basin

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Authors: Liu, Zhongqun (1); Xu, Shilin (1); Liu, Junlong (1); Ma, Liyuan (1); Liu, Sibing (2); Fan, Xin (1); Jin, Wujun (1); Li, Wangpeng (1)
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Abstract: The deep tight sandstone gas reservoir of Xujiahe Formation of Upper Triassic in the Sichuan Basin is faced with such problems as low ratio of effective wells, low reserve production rate and difficult effective scale development. In order to find out its accumulation process and enrichment laws and confirm the main control factors of high production, this paper carried out a series of studies by taking the gas reservoir of the second Member of Xujiahe Formation (hereinafter referred to as Xu-2 Member) in the Xinchang structural belt of the Sichuan Basin as the research object. Firstly, the time sequence of key hydrocarbon accumulation factors was determined by means of homogenization temperature of fluid inclusion, single-well burial and thermal history reconstruction, paleo-structure restoration and porosity evolution history analysis. And combined with structural evolution analysis, the hydrocarbon accumulation model of Xu-2 Member gas reservoir was established and the enrichment laws of natural gas in this area were analyzed. Then, based on the statistical analysis on the relationship between single-well productivity and the geological parameters (such as fault, fracture and lithofacies), the main factors controlling the high and stable production of gas wells were determined. Finally, measures for exploring and developing this type of deep tight sandstone gas reservoir efficiently were put forward. And the research results were obtained. First, the main hydrocarbon accumulation period of the Xu-2 Member gas reservoir in the Xinchang structural belt is earlier than the key period of its reservoir densification and later than the key formation period of its trap. Second, the Xu-2 Member gas reservoir presents a hydrocarbon accumulation model in the sequence of "hydrocarbon accumulation-reservoir densification-later gas reservoir adjustment" and the enrichment laws of "style setting in the early stage, densification in the middle stage and production controlling in the late stage". Third, the gas production rates of gas wells are mainly controlled by the development degree of structural fractures in the initial stage and by the thickness of favorable lithofacies in the stable production stage. The development degree of high-angle structural fractures is the key factor to control the high production of gas reservoirs. In conclusion, the zones where the structures are always uplifts and those with developed N-S striking faults are the preferred targets of Xinchang structural belt for high gas production. Natural gas in type III reservoirs with under-developed or undeveloped N-S striking structural faults cannot be developed effectively unless single-well productivity is increased by means of reservoir stimulation. © 2020, Natural Gas Industry Journal Agency. All right reserved.
Number of references: 27

Main heading: Natural gas wells
Controlled terms: Densification - Factor analysis - Fracture - Gas industry - Gases - Hydrocarbons - Natural gas - Natural gas well production - Oil field development - Petroleum reservoirs - Productivity - Proven reserves - Sandstone - Structural analysis - Tight gas - Well stimulation
Uncontrolled terms: Effective development - Enrichment law - Hydrocarbon accumulation - Sichuan Basin - Tight sandstone gas - Upper Triassic - Western Sichuan
Classification code: 408.1 Structural Design, General - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 802.3 Chemical Operations - 804.1 Organic Compounds - 922.2 Mathematical Statistics - 951 Materials Science
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131. Laboratory study and field application of self-propping phase-transition fracturing technology

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Authors: Zhao, Liqiang (1); Zhang, Nanlin (1); Zhang, Yiming (2); Luo, Zhifeng (1); Yu, Donghe (2); Liu, Pingli (1); Chen, Weiyu (1); Liu, Guohua (2); Du, Juan (1); Li, Nianyin (1); Chen, Xiang (1)
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Abstract: Conventional hydraulic fracturing technology generally has the problems of sand plugging, residue damage, equipment wear and difficult effective propping at the far end of the fracture. In this paper, a kind of self-propping phase-transition fracturing technology (SPFT) is proposed to solve these problems. That is to inject the phase-transition fracturing fluid system (PFFS) composed of phase-transition fluid (PF) and non-phase-transition fluid (NPF) into the reservoir. Under the action of formation temperature, phase transition from liquid to solid of PF occurs, and chemical-phase-transition proppant (CP) particles are generated to prop the hydraulic fractures. After NPF flows back, its occupied space serves as a high-speed flow channel of oil and gas. Finally, material performance evaluation, technological parameter optimization and field application were carried out. And the following research results were obtained. First, at 30, PFFS is a kind of solid-free liquid with good fluidity. And with the increase of temperature, CP particles are formed gradually. Second, the phase transition time of PF is adjustable, so it is suitable for reservoirs with different temperatures. Third, PFFS can generate CP with a particle size of 0.1-5.0 mm under the conditions of different formulas and different shear speed. Fourth, the fracture conductivity is directly proportional to the particle size, and the conductivity of CP is higher than that of quartz sand and ceramsite. Field application results show that the supporting means (such as fracture length and conductivity optimization, injection rate design, and temperature field simulation and calculation) further improve the SPFT system and can provide effective guidance for the field application of self-propping phase-transition fracturing. In conclusion, the success of field application confirms the feasibility of SPFT and it can be used as a new fracturing technology for reservoir stimulation.
Number of references: 25
Main heading: Hydraulic fracturing
Controlled terms: Channel flow - Fracturing fluids - Particle size

Uncontrolled terms: Chemical phase transition - Formation temperature - Fracture conductivities - Material performance - Phase transition time - Reservoir stimulations - Technological parameter optimization - Temperature field simulation
Classification code: 512.1.2 Petroleum Deposits : Development Operations - 631.1 Fluid Flow, General
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