

1. A quantitative risk assessment method for oil and gas pipelines based on failure data

Accession number: 20185206284687

Title of translation:

Authors: Shuai, Jian (1); Shan, Ke (1)

Author affiliation: (1) College of Mechanical and Transportation Engineering, China University of Petroleum, Beijing; 102249, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Pages: 129-138

Language: Chinese

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Publisher: Natural Gas Industry Journal Agency

Abstract: The risk assessment of oil and gas pipeline, one of the current hotspot issues, has gradually evolved from qualitative evaluation to quantitative evaluation. In order to reduce the effects of subjective factors in the process of quantitative risk assessment of oil and gas pipeline, we established a quantitative risk assessment model of oil and gas pipeline based on the historical data of pipeline failure. The index system of basic failure probability and modification factors for oil and gas pipeline was determined by analyzing the failure data of different types of pipelines in the database, such as Pipeline and Hazardous Materials Safety Administration (PHMSA). The modification factors are divided into three groups (i.e., quantitative index, semi-quantitative index and qualitative index) according to the degrees of difficulty in quantifying the modification factors. The first two groups of them can be quantified or quantitatively classified, and only the last one depends on the experience of experts. Thus, the subjective dependence of risk assessment is reduced greatly. Then, the risk evaluation matrix of oil and gas pipeline was constructed, the likelihood of pipeline failure was quantified by using the failure probability, and the severity of the failure consequence was quantified by means of the consequence score. Finally, this quantitative risk assessment method was applied to one gas pipeline system, and a four-color (red, orange, yellow and blue) risk distribution map was plotted to identify the high risk pipe segments. It is included that the risk assessment method based on the historical data of pipeline failures can quantify the failure probability of the pipeline objectively, and classify the risk accurately, which is conducive to the implementation of classification based risk control strategy. It is recommended to create the pipeline failure database in the whole industry or all over the country, so as to provide a basis for the quantitative risk evaluation based on historical data and even for the formulation of risk control measures. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Risk assessment

Controlled terms: Gases - Hazards - Pipelines

Uncontrolled terms: factor - Hazard factors - Historical data - Modification - Oil-and-Gas pipelines - Pipeline failures - Quantitative risk assessment - Risk distribution

Classification code: 619.1 Pipe, Piping and Pipelines - 914.1 Accidents and Accident Prevention

DOI: 10.3787/j.issn.1000-0976.2018.09.017

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

2. Design and implementation of the overall architecture of the Puguang Intelligent Gas-field Project

Accession number: 20185106260092

Title of translation:

Authors: Wang, Shouping (1); Peng, Xinling (2); Lü, Qinglin (2); Long, Fei (1); Jiang, Yiwei (2); Meng, Yuping (1)

Author affiliation: (1) Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457000, China; (2) Puguang Branch of Sinopec Zhongyuan Oilfield Company, Dazhou; Sichuan; 635000, China

Source title: Natural Gas Industry

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Issue: 10**Issue date:** October 25, 2018**Publication year:** 2018**Pages:** 38-46**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: During the development and construction of the Puguang Gas Field, Sichuan Basin, an advanced automatic control system and a fully covered industrial Internet of Things were built. In order to further increase its development benefit, the Puguang Gas Field started the construction of an intelligent gas-field project in 2013. However, there are not mature models and construction standards of intelligent oil and gas fields at home and abroad for reference. In this paper, an overall architecture design of intelligent gas field and its technical and business architecture design were demonstrated according to the principle of "overall planning, step-by-step implementation, response in each step and stressing the main points", and based on the mainstream design concept and practical experience of intelligentization. Then, combined with the key business target and implementation principle of the gas field, it was conducted and applied. And the following research results were obtained. First, the overall architecture of the intelligent gas field project includes a platform, two centers and two systems, i. e., integrated coordinated application platform, resource sharing center, intelligently assistant decision-making direction center, standard specification system and information safety system. Second, the technical architecture consists of four layers, i. e., industrial Internet of Things + equipment perception introducing layer, infrastructure cloud service layer, platform cloud service layer and software cloud service layer. Third, the business architecture is designed focusing on four support units, including exploration and development management of the gas field, production and emergency direction management of gas field, QHSE management of gas field and business management of the gas field. Fourth, the construction of the intelligent gas field project creates four abilities, i. e., assistant exploration and development decision-marking ability, production optimization and coordination ability, safety control and treatment ability and refined business management ability, to support the smooth operation, efficient management and safe production of the Puguang Gas Field. In conclusion, the intelligent management and decision-making system with the resource sharing center as the base, the integrated platform as the core and two systems as the guarantee has been preliminarily built in the Puguang Gas Field. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 13**Main heading:** Decision making**Controlled terms:** Automation - Big data - Computer architecture - Distributed database systems - Gas industry - Gases - Internet of things - Petroleum prospecting - Petroleum refining - Project management - Safety engineering**Uncontrolled terms:** Architecture designs - Assistant decision - Cloud technologies - Gas fields - Puguang gas field**Classification code:** 512.1.2 Petroleum Deposits : Development Operations - 513.1 Petroleum Refining, General - 522 Gas Fuels - 723 Computer Software, Data Handling and Applications - 731 Automatic Control Principles and Applications - 912.2 Management - 914 Safety Engineering**DOI:** 10.3787/j.issn.1000-0976.2018.10.005**Compendex references:** YES**Database:** Compendex

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Data Provider: Engineering Village

3. Non-equilibrium multiphase wellbore flow characteristics in solid fluidization exploitation of marine gas hydrate reservoirs

Accession number: 20185106260100**Title of translation:****Authors:** Wei, Na (1); Zhao, Jinzhou (1); Sun, Wantong (1); Zhou, Shouwei (1); Zhang, Liehui (1); Li, Qingping (2); Fu, Qiang (1, 2); Lü, Xin (2); Zheng, Lijun (2)**Author affiliation:** (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) CNOOC Research Institute Co., Ltd., Beijing; 100027, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 10

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Publication year: 2018

Pages: 90-99

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the core process of fractured marine gas hydrate (hereinafter referred to as hydrate) particles being transported up to the surface platform by airtight pipeline in the solid fluidization exploitation of marine gas hydrate reservoirs, influenced by the rising temperature and the dropping pressure, the solid hydrates will decompose and produce a large amount of gas at a certain critical point, causing the liquid- solid two-phase flow in the wellbore to change into complicated gas-liquid-solid multiphase non-equilibrium flow, which further aggravate well control, solid phase transportation and other safety risks. In view of this, the dynamic hydrate decomposition law in the above process was studied in this paper by establishing multiphase wellbore flow mathematical models of wellbore temperature and pressure field, hydrate phase equilibrium, hydrate dynamic decomposition in multiphase riser pipe flow, wellbore multiphase flow coupled hydrate dynamic decomposition, and a numerical calculation method was proposed and verified. The following results were obtained. First, by numerical model analysis, the effects of liquid phase displacement, solid throughput (daily gas production rate) and wellhead back pressure under different construction parameters on multi-phase non-equilibrium pipe flow were obtained. In addition, the field construction guidance measures were put forward based on multiphase non-equilibrium pipe flow characteristics as follows: to properly increase the solid throughput so as to increase the natural gas production, to appropriately increase the liquid-phase displacement and the wellhead back pressure so as to ensure well control safety. This study provides not only a theoretical basis for the prediction of multiphase non-equilibrium pipe flow in the solid fluidization exploitation, but a technical support for the field construction parameter optimization and well control safety. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 35

Main heading: Two phase flow

Controlled terms: Boreholes - Decomposition - Fluidization - Gas hydrates - Gases - Hydration - Liquefied natural gas - Marine engineering - Natural gas - Natural gas well production - Natural gas wells - Numerical methods - Oil field equipment - Pipe flow - Throughput - Wellheads

Uncontrolled terms: Construction parameter - Liquid-solid two phase flow - Natural-gas production - Numerical calculation methods - Numerical modeling analysis - Well control - Wellbore flow - Wellhead back pressures

Classification code: 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 523 Liquid Fuels - 631.1 Fluid Flow, General - 675 Marine Engineering - 802.2 Chemical Reactions - 802.3 Chemical Operations - 921.6 Numerical Methods

DOI: 10.3787/j.issn.1000-0976.2018.10.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

4. Application of the probability method to undeveloped EUR assessment of shale gas: A case study on one mature shale gas block in North America

Accession number: 20184706088033

Title of translation: -

Authors: Chen, Jinsong (1); Han, Hongbao (1); Nian, Jingbo (1); Guo, Li (1)

Author affiliation: (1) Sinochem Petroleum Exploration & Production Co., Ltd., Beijing; 100031, China

Source title: Natural Gas Industry

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ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Scale shale gas development in China is currently in its initial stage, and the study on the assessment methods for estimated ultimate recovery (EUR) of shale gas is still in the stage of continuous accumulation and improvement. In particular, the application of probability method with higher estimate accuracy in shale gas reserves assessment is limited. In this paper, shale gas EUR assessment methods were analyzed and evaluated. Then, the modified hyperbolic decline model was adopted to predict the EUR of in-service wells in one mature shale gas block in North America and its probability distribution was provided. Based on the above mentioned results, the undeveloped EUR of new wells was simulated using probability method, and the rational utilization and application effects of probability method were expounded based on four scenarios, i.e., target probability, project risk, project comparison and more rational EUR assessment. And the following research results were obtained. First, with the advancing of shale gas development project, the number of production wells increases and the exploitation technologies get mature. Thus, the analogy well groups whose rational confidence satisfies the requirement of probability method can be established so as to provide the basis for undeveloped EUR assessment using probability method. Second, the undeveloped EUR of shale gas project is partially affected by the sum of wells. The decrease of well quantity in the future can increase the uncertainty of undeveloped EUR, and on the contrary, the increase of well quantity can reduce the uncertainty of undeveloped EUR. Third, the probability method has the possibility to describe the undeveloped EUR of different levels quantitatively and can reflect project uncertainty and risk quantitatively. And it can provide the basis for project identification and decision making through project comparison from the aspects of uncertainty and risk. In conclusion, the probability method is a more rational and reliable choice for undeveloped EUR assessment of shale gas projects as the number of shale gas wells increases and the exploitation technologies are developed further. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Shale gas

Controlled terms: Gases - Intelligent systems - Monte Carlo methods - Probability distributions - Proven reserves - Risk assessment - Risk perception

Uncontrolled terms: Accuracy - Estimated ultimate recoveries - Gas development - Gas development projects - Probability methods - Project identification - Uncertainty and risks - Undeveloped EUR assessment

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 723.4 Artificial Intelligence - 914.1 Accidents and Accident Prevention - 922.1 Probability Theory - 922.2 Mathematical Statistics

DOI: 10.3787/j.issn.1000-0976.2018.07.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

5. Synthesis and performance evaluation of quadripolymer as a temperature- and salt-resistance oil well cement filtrate reducer

Accession number: 20191306691387

Title of translation:

Authors: Li, Gao (1); Fu, Qiang (1, 2); Yu, Hanghang (3); Liu, Runchang (2); Wei, Xing (2); Zeng, Heng (2)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) HSE and Technical Supervision Research Institute of PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610041, China; (3) Exploration Division, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: December 25, 2018

Publication year: 2018

Pages: 96-101

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Aiming at mitigating the defects of the currently-used oil-well filtrate reducers, a new type of high temperature- and salt-resistance filtrate reducer FRW was synthesized by selecting AMPS, DMAA, AA, AS with special functional groups as raw materials. The optimum synthesis conditions are as follows. (1) The molar ratio of

monomers AMPS:AA:DMAA:AS is 4.2:1.8:3.5:0.5, the initiator is 0.3% of the total mass of the monomer, the mass percentage of the monomer is 40%, the reaction temperature is 50, and the pH value is 7. (2) The structure of FRW was characterized by IR and NMR, and the molecular weight and heat resistance were detected by the gel permeation chromatography and thermo gravimetric analysis. Four monomers were in the copolymerization and the average molecular weight (Mw) and the number-average molecular weight (Mn) of the FRW sample product, showing a good stability and its acceptable maximum temperature being up to 289, is 86 692 and 468 689 respectively and the molecular distribution (Mw/Mn) is 5.406. (3) Such indexes as rheological and mechanical properties of the slurry with 1-2% FRW all meet with the engineering requirement. In conclusion, FRW is a good filtrate reducer with temperature and salt resistance, a better control of water loss, and being adaptable at 90-200, having no adverse effects on the rheological properties of cement paste and strength of cement engineering properties. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Oil well cementing

Controlled terms: Cements - Convergence of numerical methods - Copolymerization - Gel permeation chromatography - Gravimetric analysis - Heat resistance - Mechanical properties - Molar ratio - Molecular weight - Monomers - Oil field equipment - Oil wells - Petroleum reservoir evaluation - Rheology - Thermogravimetric analysis

Uncontrolled terms: Filtrate reducer - Molecular distribution - Rheological property - Salt resistance - Temperature resistances

Classification code: 412.1 Cement - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 801 Chemistry - 802.3 Chemical Operations - 804 Chemical Products Generally - 815.2 Polymerization - 921.6 Numerical Methods - 931.1 Mechanics - 931.3 Atomic and Molecular Physics

Numerical data indexing: Percentage 1.00e+00% to 2.00e+00%, Percentage 3.00e-01%, Percentage 4.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.12.011

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

6. Stimulating factors of urban gas consumption in China

Accession number: 20183805830754

Authors: Gao, Jian (1); Dong, Xiucheng (1)

Author affiliation: (1) School of Business Administration, China University of Petroleum, Beijing; 102249, China

Source title: Natural Gas Industry

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Pages: 130-137

Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 12

Main heading: Urban growth

Controlled terms: Commerce - Decomposition - Density of gases - Energy utilization - Gases - Natural gas - Natural gas deposits - Pipelines - Population distribution - Population dynamics - Population statistics

Uncontrolled terms: China - Consumption - Contribution rate - Driving factors - Industrial planning - LMDI

Classification code: 403.1 Urban Planning and Development - 405.3 Surveying - 512.2 Natural Gas Deposits - 522 Gas Fuels - 525.3 Energy Utilization - 619.1 Pipe, Piping and Pipelines - 802.2 Chemical Reactions - 931.2 Physical Properties of Gases, Liquids and Solids - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.03.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

7. New progress in basic natural gas geological theories and future exploration targets in China

Accession number: 20183905876125

Authors: Li, Jian (1, 2); Wang, Xiaobo (1, 2); Wei, Guoqi (1, 2); Yang, Wei (1, 2); Xie, Zengye (1, 2); Li, Zhisheng (1, 2); Guo, Jianying (1, 2); Wang, Yifeng (1, 2); Ma, Wei (1, 2); Li, Jun (1, 2); Hao, Aisheng (1, 2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) CNPC Key Laboratory of Gas Reservoir Formation and Development, Langfang; Hebei; 065007, China

Corresponding author: Wang, Xiaobo(wangxb69@petrochina.com.cn)

Source title: Natural Gas Industry

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Issue date: April 25, 2018

Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: As natural gas exploration expands to deep, ultra-deep and unconventional areas, more and more complex exploration targets are encountered. In this circumstance, it is necessary to improve the existing basic natural gas geological theories for guiding the exploration and discovery of more giant gas fields. In this paper, the researches on basic natural gas geological theories since the beginning of the 12th Five-Year Plan were engaged, and then the key exploration target zones were analyzed. Some results were obtained. First, the theory of whole-process hydrocarbon generation of organic matter has been improved and the geologic theories of organic matter hydrocarbon generation (e. g. the thermal evolution model of kerogen degradation and hydrocarbon generation and the successive gas generation of organic matter) have been developed. Second, multi-element natural gas genesis identification method, quantitative evaluation method for different types of seals/caprocks, tight sandstone gas accumulation theory for low hydrocarbon generation intensity region, and hydrocarbon accumulation theory for large-size ancient carbonate rock gas field have been established, and the geological theories of gas generation, genesis identification and hydrocarbon accumulation have been developed to provide the effective guidance for the exploration breakthrough and discovery of largesize gas fields in the key basins of China recently. Four conclusions were reached. First, ancient carbonate rocks, tight sandstone, foreland region, shale and volcanic rocks are primary exploration targets for discovering giant gas fields. Second, craton and foreland basins are still the key exploration areas, and paleo-uplift, gentle slope and thrust belt are the main enrichment zones. Third, ancient series of strata and deep formations are critical gas exploration targets in the future. Fourth, oil cracking gas in marine basins, tight sandstone gas and shale gas are the important replacement resources for future gas reserves and production growth. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 39

Main heading: Natural gas fields

Controlled terms: Biogeochemistry - Biological materials - Carbonates - Carbonation - Gas generators - Gas industry - Gases - Geological surveys - Geology - Hydrocarbons - Natural gas - Proven reserves - Reserves to production ratio - Sandstone - Tight gas - Volcanic rocks

Uncontrolled terms: Basic geological theory - Carbonate rock - Craton - Exploration domain - Foreland basin - Giant gas fields - New progress - Tight sandstones

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 802.2 Chemical Reactions - 804.1 Organic Compounds - 804.2 Inorganic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.04.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

8. Impacts of a new pricing mechanism on gas pipeline transmission companies

Accession number: 20183805830753

Authors: Rui, Xutao (1, 2); Feng, Lianying (1); Zhang, Shan (2); Du, Min (2); Wang, Suxia (3)

Author affiliation: (1) School of Business Administration, China University of Petroleum, Beijing; 102249, China; (2) PetroChina Planning and Engineering Institute, Beijing; 100083, China; (3) PetroChina Oil & Gas Pipeline Control Center, Beijing; 100007, China

Corresponding author: Feng, Lianyong(fenglyenergy@163.com)

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 12

Main heading: Costs

Controlled terms: Cost benefit analysis - Economic and social effects - Economics - Gas industry - Investments - Natural gas - Natural gas pipelines - Natural gasoline plants

Uncontrolled terms: China - Economic benefits - Load rate - Operation period - Pipeline transmission - Pricing mechanism - Service costs

Classification code: 513.2 Petroleum Refineries - 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics - 971 Social Sciences

Numerical data indexing: Percentage 7.50e+01%

DOI: 10.3787/j.issn.1000-0976.2018.03.015

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

9. Volumetric stimulation of tight sand gas reservoirs in the Sulige Gas Field, Ordos Basin: Key issues and prospects

Accession number: 20183905876140

Authors: Mu, Lijun (1, 2); Ma, Xu (1, 2); Zhang, Yanming (1, 2); Xiao, Yuanxiang (1, 2)

Author affiliation: (1) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China; (2) Oil and Gas Technology Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710061, China

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In 2012, the concept of Volumetric Stimulation was presented by PetroChina to promote the fracturing theory from classic to modern. Along with the sustainable exploration and development of tight sandstone gas reservoirs in the Sulige Gas Field, Ordos Basin, the reservoir conditions are getting more and more complicated, new difficulties and challenges have been encountered in fracturing stimulation technologies from the aspects of ideas, materials, technical processes, and so on. The following conclusions were obtained. First, to control fractures extension vertically, enhance the discharge volume, and make a slickwater fracturing design with a significant increase of liquid quantity will be the key to the improvement of single layer gas production rate. Then, to achieve a stereometric development mode for multi-layer tight gas reservoirs fractured by vertical wells with multiple layers, horizontal wells with multiple sections is a robust foundation for improving single-well production and gas recovery rates. Finally, it is the prerequisite

to lowering costs and increasing production rates to achieve a favorable fracturing design with high discharge volumes and long-term stable production rates by well completion with small holes and small-size oil tubings. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Natural gas fields

Controlled terms: Fracture - Gas industry - Gases - Horizontal wells - Metamorphic rocks - Oil well completion - Oil wells - Petroleum prospecting - Petroleum reservoirs - Reservoirs (water) - Tight gas

Uncontrolled terms: Development modes - Ordos Basin - Slickwater fracturing - Sulige gas field - Tight sand gas reservoirs - Unconventional natural gas - Volumetric stimulation

Classification code: 441.2 Reservoirs - 512 Petroleum and Related Deposits - 522 Gas Fuels - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.04.019

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

10. Progress and prospects of natural gas development technologies in China

Accession number: 20183905876130

Authors: Jia, Ailin (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China

Corresponding author: Jia, Ailin(jal@petrochina.com.cn)

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Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 21

Main heading: Petroleum prospecting

Controlled terms: Coal bed methane - Coal deposits - Energy resources - Gas industry - Gases - Methane - Natural gas - Shale gas - Tight gas

Uncontrolled terms: China - Deep gas - Demand - Development strategies - Development technology - Import - Production rates

Classification code: 503 Mines and Mining, Coal - 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.1000-0976.2018.04.009

Compendex references: YES

Database: Compendex

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11. Changing laws of formation pressure of constant-volume fractured enclosed reservoirs under the hydraulic pressure of drilling fluid

Accession number: 20183905879914

Authors: Zhao, Xiangyang (1, 2); Meng, Yingfeng (2); Yang, Shunhui (1); Wei, Na (2); Li, Gao (2); He, Qingshui (1)

Author affiliation: (1) Sinopec Research Institute of Petroleum Engineering, Beijing; 100101, China; (2) State Key Laboratory of Oil and Gas Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

Corresponding author: Meng, Yingfeng(cwctmyf@swpu.edu.cn)

Source title: Natural Gas Industry

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The complex situation of leakage and blowout coexistence often occur during the drilling of fractured strata. At present, their mechanisms are described only based on experience without basic theoretical studies or model descriptions. In this paper, a great number of actual drilling, logging and testing data of the Yada Oil Field in Iran were taken as an example to carry out simulation experiments and CFD single-fracture constant volume simulation verification on the liquid-liquid constant volume displacement behavior by means of the visual liquid-liquid displacement experiment device based on the real fractures. Then, the influential laws of drilling fluid density, wellhead back pressure and crack width on formation pressure were analyzed. And the following research results were obtained. First, with the increase of drilling fluid density, the displacement phenomenon gets more and more obvious and the formation pressure drops rapidly. And as the displacement goes, the formation pressure is basically constant. Second, the formation pressure increases gradually with the increase of back pressure. Third, the formation pressure rises gradually to the maximum value when high-density drilling fluid reaches the crack plate. And as the displacement goes, the formation pressure reaches a new balance. Fourth, the wider the crack is, the greater the formation pressure changes, the less affected the displacement form is by the morphology of crack surface and the faster the displacement advancing is. It is concluded that the formation pressure of constant-volume oil/gas reservoirs is positively related to the drilling fluid density and back pressure. Therefore, it is recommended to combine plugging with wellhead pressure control in drilling and to apply the pressure relief method to well killing. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Cracks

Controlled terms: Computational fluid dynamics - Drilling fluids - Fracture - Fracture testing - Infill drilling - Liquids - Oil fields - Petroleum reservoir engineering - Wellheads

Uncontrolled terms: Constant volumes - Formation pressure - Laboratory test - Pressure relief - simulation - Well killing

Classification code: 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 723.5 Computer Applications - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.06.012

Compendex references: YES

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12. Factors influencing the biogenic gas production of low rank coal beds in the jiergalangtu sag, erlian basin

Accession number: 20183905879906

Authors: Chen, Hao (1, 2); Qin, Yong (1); Deng, Ze (2); Geng, Meng (2); Li, Guizhong (2); Sang, Guangjie (3); Xia, Daping (4)

Author affiliation: (1) China University of Mining and Technology, Xuzhou; Jiangsu; 221116, China; (2) PetroChina Research Institute of Petroleum Exploration and Development, Langfang; Hebei; 065007, China; (3) PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China; (4) Henan Polytechnic University, Jiaozuo; Henan; 454000, China

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The study on the factors influencing the biogenic gas production of low rank coal beds is of great significance to the search of the favorable biogas enrichment areas of similar coal beds and the guidance of the microbial stimulation technologies. In this paper, the lignite samples taken from the Jiernalangtu sag in the Erlian Basin were selected to carry out the simulation experiment of biogenic coalbed methane under different temperatures, pH values, oxidation-reduction potentials (Eh) and trace element concentrations. Then, the influences on biogenic gas production were discussed and the optimal biogenic gas production condition was determined. And the following research results were obtained. First, in the simulation experiments, the biogas production of coal beds increases first and then decreases with the increase of temperature, pH and trace element concentration and the decrease of Eh. Second, in the case of temperature 30-35 , pH 7.0-7.5 and Eh -225 mV, the metabolism of methanogen is the most active and the most favorable for the generation of biogas, so biogenic gas production can be promoted by adding the trace elements (Fe²⁺ and Ni²⁺) of proper concentration. It is concluded that a proper burial depth (300-600 m), a weak runoff hydrodynamic condition and an anaerobic environment constitute the favorable conditions for the generation of biogas in the Jiernalangtu sag, Erlian Basin. Moreover, the addition of appropriate trace elements can be an effective means of microbial stimulation. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29

Main heading: Coal deposits

Controlled terms: Biogas - Coal - Coal bed methane - Firedamp - Methane - Methanogens - Redox reactions - Trace elements

Uncontrolled terms: Bacteria detection - Erlian Basin - Gas productions - Jiernalangtu sag - Microbial stimulation

Classification code: 461.9 Biology - 503 Mines and Mining, Coal - 522 Gas Fuels - 524 Solid Fuels - 802.2 Chemical Reactions - 804.1 Organic Compounds

Numerical data indexing: Size 3.00e+02m to 6.00e+02m, Voltage -2.25e-01V

DOI: 10.3787/j.issn.1000-0976.2018.06.004

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

13. Innovation of strategic cost management of natural gas in China's petroleum enterprises

Accession number: 20183905863725

Authors: Li, Zhong (1); Ren, Limei (2); Zou, Xiaoqin (2); Xie, Jianjun (1); Bao, Sifeng (1); Luo, Tingting (3)

Author affiliation: (1) Finance Department, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Natural Gas Economic Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (3) Chengdu Public Affair Management Center, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 140-147

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 17

Main heading: Cost reduction

Controlled terms: Competition - Efficiency - Gases - Gasoline - Management - Natural gas - Natural gasoline plants - Planning - Sustainable development

Uncontrolled terms: China - Competitive advantage - Connotation - Cost management - Efficiency improvement - Management modes - Oil and gas - style

Classification code: 513.2 Petroleum Refineries - 522 Gas Fuels - 523 Liquid Fuels - 911.2 Industrial Economics - 912 Industrial Engineering and Management - 912.2 Management - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.05.017

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

14. Mechanism and critical parameters of liquid-carrying behaviors in gas wells

Accession number: 20182905565473

Authors: Geng, Xinzhong (1)

Author affiliation: (1) Natural Gas Production & Sale Plant, Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 487162, China

Corresponding author: Geng, Xinzhong(gengxinzhong@163.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: January 25, 2018

Publication year: 2018

Pages: 74-80

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Currently, the critical velocity method and the critical kinetic energy factor method are mainly applied for in identifying liquid-carrying behaviors in gas wells. However, it is unclear which one is more scientific and suitable. In this paper, the liquid-carrying mechanism and patterns in two-phase vertical pipes were re-discussed in view of the basic features of a circular pipe flow. The following results were obtained. First, liquid accumulation in two-phase vertical pipes occurs predominantly due to the incapability to maintain gas continuously. In the case of continuous liquid-carrying, liquid exists in the form of an annular film around pipe walls, and pipe flow is mainly an annular mist flow. Second, the fluid-carrying behavior of gas flow is, in fact, induced by an energy drive. Alteration in fluid-carrying capacities indicate qualitative changes in the flow patterns of both phases due to the quantitative changes in the gas flow energy of unit volume. Third, the critical kinetic energy factor technique can effectively reflect the basic physical theories related to energy-driven fluid flows. Generally speaking, its fluid-carrying mechanism coincides well with the basic characteristics and law of energy conservation of an annular flow. Fourth, with radial differences in cross-sectional flow velocities ignored, the critical velocity method may not accurately reflect the actual fluid-carrying behaviors in two-phase vertical pipes. Fifth, differences in physical properties of fluids lead to slight variations in critical kinetic factors with continuous liquid-carrying flows. Generally, the critical kinetic energy factor for annular mist flows shall be 10 Pa^{0.5}. These results highlight the fluid-carrying mechanism and the nature of flows in two-phase vertical pipes, clarify root causes for significant differences in models, and define the universal diagnosis techniques and parameters. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Liquids

Controlled terms: Flow of gases - Gases - Kinetic energy - Kinetics - Natural gas wells - Pipe flow - Velocity

Uncontrolled terms: Critical velocities - Gas well - Mist flows - Two phase - Vertical pipe flow

Classification code: 512.2.1 Natural Gas Fields - 631.1 Fluid Flow, General - 631.1.2 Gas Dynamics

DOI: 10.3787/j.issn.1000-0976.2018.01.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

15. Features and prevention of gas hydrate blockage in test strings of deep-water gas wells

Accession number: 20182905565474

Authors: Wang, Zhiyuan (1); Zhao, Yang (1); Sun, Baojiang (1); Yu, Jing (1)

Author affiliation: (1) College of Petroleum Engineering, China University of Petroleum-East China, Qingdao; Shandong; 266555, China

Corresponding author: Sun, Baojiang(sunbj1128@vip.126.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: January 25, 2018

Publication year: 2018

Pages: 81-88

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Due to the uncertainties in formation mechanism of gas hydrate blockages in strings during the test of deep-water gas wells, inhibitors are either excessively consumed or inefficiently used when conventional prevention techniques are used. In this paper, a study was conducted on multi-phase flows, in terms of hydrate formation kinetics and hydrate particle migration and settlement kinetics. In this process, a model for quantitative prediction of hydrate blockage was built to predict when and where the blockage occurs in the strings and evaluate the severity of such blockage, in order to define the high-risk zones. Eventually, an innovative hydrate blockage prevention technique based on hydrate blockage free window (HBFW) was proposed to determine the optimal concentration and the flow rate of inhibitors. The study results are in the following four aspects. First, gas hydrates generated in the wellbore may deposit on the internal walls of strings. With the increase in thicknesses of such gas hydrate layers, the diameter of a pipe string decreases. Accumulation of gas hydrates generated around liquid film on pipe walls is the key contributor to the blockage in strings. Second, as the water depth increases or the gas production reduces, the HBFW turns to be narrower for production safety, and the time to initiate blockage is shorter. Third, application of hydrate inhibitors can effectively delay the occurrence of blockage and expand the window of safe production. Fourth, the innovative prevention technique can effectively reduce the volume and the flow rate of inhibitors (by 50% in the case study). The innovative technique effectively eliminates the problems related to the excessive consumption of inhibitors in the conventional methods and provides a valuable reference for the prevention of gas hydrates formation in deep-water gas well tests. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 30

Main heading: Gas hydrates

Controlled terms: Flow rate - Gases - Hydration - Liquid films - Natural gas wells - Offshore gas well production - Offshore gas wells - Walls (structural partitions) - Well testing

Uncontrolled terms: Blockage - Deepwater - Gas well testing - Hydrate blockages - Mist flows - Prevention methods - Volume of inhibitor

Classification code: 408.2 Structural Members and Shapes - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631 Fluid Flow

Numerical data indexing: Percentage 5.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.01.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

16. Decomposition characteristics of natural gas hydrates in hydraulic lifting pipelines

Accession number: 20184706088044

Title of translation:

Authors: Xu, Hailiang (1); Kong, Weiyang (1); Yang, Fangqiong (1)

Author affiliation: (1) College of Mechanical and Electrical Engineering, Central South University, Changsha; Hunan; 410083, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: July 25, 2018

Publication year: 2018

Pages: 129-137

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For the sake of guiding parameter setting of the hydraulic lifting pipeline system for cutter-suction mining of natural gas hydrates in sea beds (hereinafter, hydrates for short), the decomposition characteristics of hydrates in hydraulic lifting pipelines and the effects of flow parameters on decomposition characteristics were studied in this

paper. A temperature-pressure model for the hydrate hydraulic lifting pipeline, a hydrate decomposition mass transfer model and a pipeline multi-phase flow model were established using mathematical modeling method according to thermodynamics and fluid mechanics. Then, the relationships of the temperature and pressure of pipeline fluid, the amount of hydrate particulate matter and the decomposition surface vs. the seawater depth under the effect of different influencing factors during the transformation from solid-liquid two-phase flow to solid-liquid-gas three-phase flow were analyzed. And the following research results were obtained. First, the decomposition of hydrate slows down and the decomposition surface moves upward slightly with the increase of flow rate in the pipeline. Second, particle size basically has no effects on the temperature and pressure of pipeline fluid, the phase equilibrium pressure and hydrate decomposition surface. However, only the hydrate particles whose diameter is smaller than 0.2 mm can be completely decomposed in the pipeline while the decomposition of those whose particles size is greater than 2.0 mm is negligible. Third, if the back pressure at the outlet is positive, the decomposition surface moves upward and the decomposition of hydrate slows down with the increase of the back pressure. And if the back pressure at the outlet is negative, the decomposition surface moves downward and the decomposition of hydrate speeds up with the increase of the back pressure. Fourth, the decomposition of hydrate slows down and the decomposition surface moves upward with the increase of mining depth. However, the decomposition velocity and decomposition surface are basically unchanged when the mining depth is below 1 500 m under water. Fifth, the experimental results are basically consistent with the numerical simulation results, and it is indicated that the newly established models are of high reliability. In conclusion, decomposition surface height and decomposition velocity can be adjusted by controlling flow rate and outlet back pressure rationally during the cutter-suction mining of hydrates while the influences of particle diameter and mining depth on gas production rate need not be taken into consideration. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 25

Main heading: Gas hydrates

Controlled terms: Computer simulation - Cutting machines (mining) - Fluid mechanics - Gases - Hydration - Liquefied gases - Mass transfer - Natural gas - Numerical models - Particle size - Phase transitions - Pipelines - Seawater effects - Temperature - Two phase flow

Uncontrolled terms: Decomposition characteristics - Hydrate decomposition - Influential factors - Mass transfer modeling - Multi-phase flow models - Seabed - Solid-liquid two phase flows - Temperature and pressures

Classification code: 471.4 Seawater, Tides and Waves - 502.2 Mine and Quarry Equipment - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 631.1 Fluid Flow, General - 641.1 Thermodynamics - 641.3 Mass Transfer - 723.5 Computer Applications - 801.4 Physical Chemistry - 921 Mathematics - 931.1 Mechanics

Numerical data indexing: Size 1.50e+03m, Size 2.00e-03m, Size 2.00e-04m

DOI: 10.3787/j.issn.1000-0976.2018.07.018

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

17. A new high-precision timely monitoring and metering system for early kick and loss

Accession number: 20191306691388

Title of translation:

Authors: Zhu, Huangang (1); Wang, Shujiang (1); Li, Zongqing (1); Yan, Xiuliang (1); Song, Zhongwen (1); Gong, Peibin (1)

Author affiliation: (1) Drilling Technology Research Institute, Sinopec Shengli Oilfield Service Corporation, Dongying; Shandong; 257017, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 102-106

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Kick and loss are two complicated incidents that affect the construction safety in oil and gas well drilling. The commonly-used kick/loss monitoring methods are disadvantageous with monitoring lag and low metering precision, which may cause well collapse, pipe sticking and well blowouts due to untimely detection and improper treatment.

In this paper, a new type of kick/loss monitoring and metering system was designed based upon a comparative analysis of several kick/loss monitoring methods commonly used on rig sites. This new system has the functions of early monitoring and alarm, kick/loss velocity metering, total loss metering and automatic filling, and its feasibility was verified through laboratory experiments. And the following research results were obtained. First, the monitoring tank of this new system is divided into two chambers, i.e., a main chamber and a secondary chamber. The return of drilling fluid partially flows back to the shale shaker through the main chamber, and the rest overflows into the secondary chamber. Second, the internal cross section area of the secondary chamber is small, which increases the response sensitivity to liquid level change, so kick/loss can be detected in time. Third, the water head of the outlet pipeline of the main chamber remains constant and the outlet flow is stable, so kick/loss velocity and total kick/loss can be calculated quantitatively based on the change of liquid level in the secondary chamber. And the monitoring error of kick/loss velocity is less than 8%. Fourth, in the process of tripping out, the drilling fluid in the monitoring tank flows into the wellbore under the action of self weight to keep the full liquid level of the wellbore all the time. As a result, lagged filling and partial filling are eliminated. In conclusion, this new kick/loss monitoring system is economical and practical, and giving a full play to the advantages of ground survey and alarm timely and accurately. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Monitoring

Controlled terms: Boreholes - Drilling fluids - Filling - Infill drilling - Liquids - Oil field equipment - Oil well drilling - Oil wells - Tanks (containers) - Velocity

Uncontrolled terms: Early kick - Leakage velocities - Metering systems - Secondary chamber - Total loss

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 - 619.2 Tanks - 691.2 Materials Handling Methods

Numerical data indexing: Percentage 8.00e+00%

DOI: 10.3787/j.issn.1000-0976.2018.12.012

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

18. Transient flow simulation on the induced flow in well cleaning during deepwater gas well tests

Accession number: 20191006600870

Title of translation:

Authors: He, Yufa (1); Li, Zihan (1); Gao, Fei (1); Zhang, Binhai (1); Huang, Jing (1); Li, Yingying (1)

Author affiliation: (1) CNOOC Research Institute, Beijing; 100028, China

Corresponding author: Li, Zihan(lizh19@cnooc.com.cn)

Source title: Natural Gas Industry

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Publication year: 2018

Pages: 59-64

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The change of flow pattern, pressure and temperature inside the wellbore in the actual process of blowout is not understood accurately, so it is unable to judge whether the key parameters of induced flow in well cleanup during deepwater gas well test are designed rationally. In this paper, the testing of an actual gas well was taken as the research object. Based on the transient flow model of wellbore multiphase flow, transient numerical simulation was conducted on the induced flow in well cleanup to truly reproduce the flowing situation of displacement fluid in the borehole under the actual operating condition. The unsteady-state change of pressure and temperature profiles along the depth in the process of induced flow in well cleanup was quantified. Besides, sensitivity analysis was performed on the key parameters of induced flow. And the following research results were obtained. First, the maximum error between the simulated tubing pressure and the measured value is about $\pm 5\%$, which indicates good fitting. It is verified that the model is accurate and reliable. Second, the cleanup time increases with the decrease of choke size. Third, the higher the flow inducing liquid cushion is, the faster the gas initially flows out of the bottom hole, the higher the

excitation pressure is and the shorter the cleanup time is. Fourth, the induced flow in well cleanup shall be supplied with large choke, large-diameter test string and rational liquid cushion height as much as possible while ground treatment equipments are kept safe, smooth, economical and effective. In conclusion, these research results promote the successful simulation on the transient flow process of induced flow in well cleanup during deepwater gas well tests, and they can be used as a guidance for the formulation of testing system, the design and type selection of test strings and equipments and the guarantee of deepwater testing safety. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Offshore gas well production

Controlled terms: Boreholes - Computer simulation - Flow patterns - Gases - Multiphase flow - Numerical models - Offshore gas wells - Oil field equipment - Safety testing - Sensitivity analysis - Transition flow - Well testing

Uncontrolled terms: Gas well testing - Pressure field - Unsteady-state flow - Well cleaning - Wellbore

Classification code: 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 631.1 Fluid Flow, General - 723.5

Computer Applications - 914.1 Accidents and Accident Prevention - 921 Mathematics

DOI: 10.3787/j.issn.1000-0976.2018.11.007

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

19. An experimental study on oxidizer treatment used to improve the seepage capacity of coal reservoirs

Accession number: 20185206284678

Title of translation:

Authors: Kang, Yili (1); Tu, Yingqian (1); You, Lijun (1); Li, Xiangchen (1); Huang, Fansheng (1)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

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Abbreviated source title: Natur. Gas Ind.

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Issue date: September 25, 2018

Publication year: 2018

Pages: 61-69

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: It is difficult to realize physical stimulation of coal reservoirs, and the recovery factor of coalbed methane (CBM) can be enhanced by applying strong oxidizer and oxidation action to stimulate coal reservoirs. At present, however, the oxidation in the field of CBM is less researched, and the experimental study to systematically evaluate the effect of oxidation action on the seepage capacity of coal reservoirs is rare. In this paper, the coal samples taken from coal seams of the Jurassic Xishanyao Fm in the Heishan Coal Mine, Tuokexun, Xinjiang, were selected as the study objects. Hydrogen peroxide solution immersion experiments were carried out on columnar and powdered coal samples, respectively to measure the permeability of columnar coal samples, the dissolution rate of powdered coal samples and the property parameters of hydrogen peroxide solution. Then, the reaction mechanisms between coal and hydrogen peroxide and the mechanisms to improve the seepage capacity of coal reservoir were analyzed by means of X-ray diffraction, scanning electron microscope (SEM), infrared spectrum and wetting angle measurement. Finally, the stimulation effect of oxidation was compared with that of acidification. And the following research results were obtained. First, the permeability of coal samples is increased significantly after oxidation, and it is 1.4-3.2 times that the original permeability. Second, a large number of micro-fractures and dissolved pores are formed in coals after the oxidation, and consequently pore connectivity is improved greatly. Thus, the amount of associative hydroxyl and carboxyl functional groups on the surface of coals increases, and the water wettability on the surface reduces. Third, organic matter and pyrite are oxidized and consumed easily, and the generated H⁺ and small-molecule aliphatic acids will dissolve inorganic mineral components further. And fourth, oxidation also has the advantage of acidification dissolving inorganic mineral components, so the coal powder is weak and controllable. In conclusion, strong oxidizer

has the potential to become a new technology for coal reservoir stimulation. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 31

Main heading: Oxidation

Controlled terms: Acidification - Coal - Coal deposits - Coal mines - Dissolution - Hydrogen peroxide - Mechanical permeability - Metal recovery - Methane - Minerals - Peroxides - Petroleum reservoir engineering - Pyrites - Reservoirs (water) - Scanning electron microscopy - Seepage - Wetting

Uncontrolled terms: Coal reservoirs - Coal rock - Micro-fracture - Pore connectivity - Solve inorganic

Classification code: 441.2 Reservoirs - 482.2 Minerals - 503 Mines and Mining, Coal - 503.1 Coal Mines - 512.1.2

Petroleum Deposits : Development Operations - 524 Solid Fuels - 802.2 Chemical Reactions - 802.3 Chemical Operations - 804.1 Organic Compounds - 804.2 Inorganic Compounds - 822.2 Food Processing Operations

DOI: 10.3787/j.issn.1000-0976.2018.09.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

20. Strategic thinking on the role of a major force in providing good services of domestic natural gas exploration and development engineering and technology in the new era

Accession number: 20184706088027

Title of translation:

Authors: Li, Aimin (1)

Author affiliation: (1) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610056, China

Corresponding author: Li, Aimin(liaim_sc@cnpc.com.cn)

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: Along with the rapid development of natural gas demand and consumption in China, the challenge of a strong urge for increasing gas reserves and productivity also brings about the opportunities for progress in oil and gas engineering and technology. The CNPC Chuanqing Drilling Engineering Co., Ltd. (shortened as Chuanqing Drilling hereinafter), as one of the main companies providing oil and gas engineering and technology services, has grown up as one of the well-known global head-contractors with scale strength and technical level highly enhanced over the last decade, and is now playing an outstanding role especially in both conventional and unconventional natural gas exploration and development in present and future China. In entering into a new era, Chuanqing Drilling will act as a main force in providing services of domestic natural gas exploration and development engineering and technology to follow the strategic deployment of national energy revolution and comply with the National 13th Five-Year Plan for Natural Gas Development and the CNPC's Programming during the period of the National 13th Five-Year Plan. Based upon an overall analysis of the new situation of upstream exploration and development and changes in natural gas supply-demand pattern, in combination with a comparative analysis of CNPC's reform on engineering and technology services and Chuanqing Drilling's own development advantages, a new position of Chuanqing Drilling as an oil & gas engineering and technology head-contractor is determined and the strategic planning will focus on strategic routes, competitive strategies, business deployment, market layout and guarantee measures. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 8

Main heading: Gas engineering

Controlled terms: Competition - Contractors - Gas supply - Gases - Geological surveys - Infill drilling - Natural gas - Natural gas wells - Natural gasoline plants - Oil field development - Oil well drilling - Proven reserves - Shale gas

Uncontrolled terms: China - Drilling engineering - Engineering and technology - Exploration and development - Strategic deployment

Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 513.2 Petroleum Refineries - 522 Gas Fuels - 911.2 Industrial Economics - 912 Industrial Engineering and Management

DOI: 10.3787/j.issn.1000-0976.2018.07.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

21. Operation mechanism of natural gas market in UK and its enlightenments to China's market-oriented reform

Accession number: 20185106260106

Title of translation:

Authors: Zhou, Xuan (1, 2); Dong, Xiucheng (3); Zhou, Miao (4); Ma, Linhe (5)

Author affiliation: (1) School of Business Administration, China University of Petroleum, Beijing; 102249, China; (2) China Petroleum Technology and Development Corporation, Beijing; 100029, China; (3) School of International Trade and Economics, University of International Business and Economics, Beijing; 100029, China; (4) Beijing Engineering Branch, China Petroleum Engineering and Construction Corporation, Beijing; 100085, China; (5) Sinopec Great Wall Gas Investment Co. Ltd, Beijing; 100029, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: National Balancing Point (NBP) of UK created the market operation and pricing mechanism based on a virtual trading point, and provided a regional market model for creating a single liberalized EU gas market. Therefore, studying on the operation mechanism of UK's natural gas market provides insights and references for China's market-oriented reform and trading hub construction. In view of this, we first analyzed the operation mechanisms of national balancing point, natural gas market and capacity market, then focused on the regulation and pricing models of capacity market, and finally proposed implications of UK's experience for China's natural gas market-oriented reform as follows. (1) Reform measures such as precedence of legislation, independence of pipeline networks, separation of vertically integrated incumbents, enforcement on giving up market share, and cultivation of new market players are worth learning from; (2) It is suggested that China's natural gas market-oriented reform should combine with the mixed ownership reform of state-owned enterprises in the industry; (3) Studying theoretical and model application of regulatory economics in UK will help enhance government regulation on transportation networks in China; (4) Many provincial natural gas pipeline networks in China are suitable for being developed into regional market pricing centers based on virtual trading points. In conclusion: (1) Virtual trading point realizes the standardization of natural gas in a larger geographical area, which is conducive to enhancing operational efficiency, transparency, liquidity and fairness of the market; (2) The operation and trading of virtual trading point is relatively simple, but capacity market of pipeline networks is based on complicated pricing theory and more difficult to supervise; (3) The price of virtual trading point can only reflect the supply and demand situation within a regional market. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Commerce

Controlled terms: Competition - Costs - Gases - Laws and legislation - Natural gas - Natural gas pipelines - Natural gas transportation - Privatization

Uncontrolled terms: Capacity markets - National balancing points - Natural gas markets - Operation mechanism - Virtual trading - Wholesale markets

Classification code: 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics - 911.2 Industrial Economics - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.10.019

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

22. Determination of drilling fluid density for safety drilling in multi-pressure system strata and its Application: A case study on Ø333.38 mm hole section of Well Wutan 1 in the Sichuan Basin

Accession number: 20184706088037

Title of translation: -1 Ø333.38 mm

Authors: Zheng, Shuquan (1); Luo, Liangyi (1); Chen, Zhengyun (1); Wu, Daofu (1); Fu, Huacai (1); Zhong, Guangrong (1); Huang, Chunhua (1); Luo, Yuhong (2)

Author affiliation: (1) Chuandong Drilling Company, CNPC Chuanqing Drilling Engineering Co., Ltd., Chongqing; 401147, China; (2) Exploration Business Division, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

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Abbreviated source title: Natur. Gas Ind.

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: According to the design of Well Wutan 1, a wildcat well deployed in the Dazhou-Kaijiang paleo-uplift, eastern Sichuan Basin, the strata drilled by Ø333.38 mm bit is composed of multiple intervals with a complex pressure system, and gas layers and the layers where circulation loss and collapse tend to happen easily will be encountered, so how to keep a rational drilling fluid density so as to reach the target layers smoothly shall be researched and solved. In this paper, the engineering and technical difficulties and treatment technologies of Well Wutan 1 were analyzed. Then, the solution of safety operation density was put forward after 5 calculation methods for safety operation density were summarized, including well control safety density, collapse suppression density, hole shrinkage suppression density, critical density of thick mud cakes and leakage density. Finally, the solution was applied on site. And the following research results were obtained. First, in hole shrinkage sections or the sections with active gas shows, the safety operation density was the higher one between well control safety density and shrinkage suppression density. Second, in the hole sections where circulation loss or collapse was dominant, the safety operation density was the higher one between well control safety density and collapse suppression density. Besides, plugging and other technological measures were adopted to improve the formation-bearing capacity. Third, the Ø333.38 mm hole of Well Wutan 1 was drilled smoothly, and the wellbore was of high quality and Ø273.05 mm casing was run to the designed position smoothly. In conclusion, the safety drilling difficulties of Well Wutan 1 in multi-pressure system strata are solved successfully by using the above mentioned solutions. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Wildcat wells

Controlled terms: Boreholes - Density (specific gravity) - Drilling fluids - Infill drilling - Safety engineering - Shrinkage

Uncontrolled terms: Circulation loss - Collapse - Overflow - Pressure system - Safety operations - Sichuan Basin

Classification code: 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 914 Safety Engineering - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.07.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

23. A new architecture characterization method for braided river channel bar sandbody

Accession number: 20184706088029

Title of translation:**Authors:** Ma, Zhixin (1, 2); Zhang, Ji (1, 2); Xue, Wen (1, 2); Fu, Bin (1, 2); Bai, Yuqi (1, 2); Peng, Xuehua (3); Su, Wenjie (3)**Author affiliation:** (1) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China; (2) Exploration and Development Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (3) No.3 Gas Production Plant, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 16-24**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: At present, the architecture characterization of braided rivers mainly focuses on the identification of channel bar sandbody in a single well, and the depiction of channel bar sandbody in plane is more random, so the accuracy of analysis results is reduced. In this paper, the outcrop section and the proto type model of modern braided river sediment were analyzed. Then, the development location of silt layer inside channel bar sandbody and the contact relationships between different architecture units were investigated. Finally, the braided river sandbody in the lower submember of 8th Member, Shihezi Fm, Middle Permian (P2x8L) in the Su X infill well block of the Sulige Gas Field, Ordos Basin, was taken as the study object to classify the architecture unit of channel sandbody and locate the drilling position of channel bar in the well accurately according to the contact relationships between different architecture units, combined with well logging, mud logging, core and other data. In this way, the architecture characterization method for underground braided river sandbody was developed and applied to the development and drilling of gas field. And the following research results were obtained. First, the development of silt layer is in close relationship to the position of channel bar, and vertical superposition of microfacies at different positions of channel bar presents strong regularity, so it can be used as an important reference for analyzing the architectures of braided river reservoirs. Second, the braid river sandbody consists of 3 architecture units, i.e., channel bar, braided channel and flood plain, among which channel bar is the main hydrocarbon accumulation unit. Third, in plane, P2x8L in Su X infill well block is in the sedimentation pattern of "channel bar alternating with braided channel, wide channel bar and narrow braided channel". The sandbodies with different sedimentation types are different in size. And the channel bar sandbody is 250-300 m wide and 500-900 m long. Fourth, in the verification well (Well SX-1), two channel bar sandbodies and one braided channel sandbody are encountered. The number and size of the encountered channel bars and the relationship between channel bar and braided channel are consistent with the analysis results provided by the new method. In conclusion, this new reservoir architecture characterization method for spatial location of channel bar sandbody, which takes "logging response characteristics, silt layer development location and vertical microfacies superposition mode" as the mark can be used to determine the distribution location of channel bar sandbody in plane, and it is beneficial to reveal the spatial distribution laws of braided river channel bar sandbody and improve the reliability of channel bar sandbody characterization results. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 38**Main heading:** Bars (metal)**Controlled terms:** Architecture - Gas industry - Infill drilling - Location - Metamorphic rocks - Mud logging - Rivers - Silt**Uncontrolled terms:** Braided river - Logging response - Micro-facies - Ordos Basin - Sandbody - Sulige gas field - Well patterns**Classification code:** 402 Buildings and Towers - 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 535.1.2 Rolling Mill Practice**Numerical data indexing:** Size 2.50e+02m to 3.00e+02m, Size 5.00e+02m to 9.00e+02m**DOI:** 10.3787/j.issn.1000-0976.2018.07.003**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

24. Present situation and prospect of performance evaluation methods for kinetic hydrate inhibitors (KHIs)

Accession number: 20185206284684

Title of translation:

Authors: Fan, Shuanshi (1); Guo, Kai (1); Wang, Yanhong (1); Lang, Xuemei (1)

Author affiliation: (1) MOE Key Laboratory of Heat Transfer Enhancement and Energy Conservation, School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou; Guangdong; 510640, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Kinetic hydrate inhibitors (KHIs) are a kind of economical, effective and promising technology to remove the blockage of gas hydrate in gas pipelines. So far, however, KHIs have not been applied extensively in domestic oil and gas fields. Therefore, it is in an urgent need to strengthen KHIs development and performance evaluation studies. In this paper, the classification of KHIs was summarized again based on the hydrate formation principles. Then, the advantages and disadvantages of 13 hydrate inhibitor evaluation methods were analyzed, e.g. KHI induction time influenced by temperature and pressure, crystal growth inhibition method (CGI), microscopic kinetics method and circulation conduit simulation method. And accordingly, a set of methods were developed which can improve the value for comparison between the evaluation results from different methods and equipments and reduce the gaps between evaluation and actual application results. And the following research results were obtained. First, the evaluation methods used in the stage of hydrate nucleation include KHI induction time influenced by temperature and pressure, visual observation for induction time method, and sub-cooling degree method. Second, the evaluation methods used in the stage of hydrate growth include the growth rates influenced by temperature and pressure change, visual observation for growth morphology, CGI method, and microscopic kinetics method. Third, the methods used in both stages include water content method, composition change method, differential scanning calorimeter method, ultrasonic measurement method, laser measuring method, electro-conductibility method and so on. Finally, the development directions and suggestions on KHIs evaluation methods were proposed as follows. First, many methods shall be combined organically. Multi-perspective (sound, light, electricity, heat, kinetics and other properties), multi-scale (macroscopic, microcosmic, mesoscopic, and nanoscopic) and multi-index (sub-cooling degree, induction time, growth rate) and their combination will be the future development direction of KHIs evaluation methods with more authentic, comprehensive and accurate evaluation. Second, it is necessary to pay more attention to investigating the mechanisms of KHIs and figuring out and verifying its mechanisms by using more advanced equipments and designing the related experiments to provide a guidance for the development of more superior KHIs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 62

Main heading: Economic and social effects

Controlled terms: Cooling - Differential scanning calorimetry - Gas hydrates - Gas industry - Growth kinetics - Growth rate - Hydration - Kinetics - Pipelines

Uncontrolled terms: Evaluation - Inhibition mechanisms - Inhibitor evaluation method - Kinetic hydrate inhibitors - Pipeline blockages - Present situation - Prospect

Classification code: 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 641.2 Heat Transfer - 931 Classical Physics; Quantum Theory; Relativity - 944.6 Temperature Measurements - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.09.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

25. Natural gas supersonic cyclone separation technology with the integration of condensation and centrifugation

Accession number: 20184706088039

Title of translation:
Authors: Duan, Zhenya (1); Liang, Longhui (1); Li, Shuai (1); Liu, Zhan (1); Li, Zhenjiang (1); Liu, Xinzhe (2)

Author affiliation: (1) College of Electromechanical Engineering, Qingdao University of Science & Technology, Qingdao; Shandong; 266061, China; (2) Leap & Top Solution Co., Ltd., Tianjin; 300384, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 7

Issue date: July 25, 2018

Publication year: 2018

Pages: 93-99

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The supersonic cyclone separation technology for natural gas has the advantages of simple and compact structures, no rotating components, high reliability, no chemical additives, low investment and maintenance costs, etc., and its industrial application prospect is broad. Due to its complex process, however, its theoretical research is not mature yet. In this paper, a series of investigation were conducted on this technology to promote its large-scale industrial application. First, the structure and working principle of a natural gas supersonic cyclone separator were introduced. Then, the latest progress of numerical simulation on its cyclone flow process, internal condensation process and internal flow process was described. Finally, the related experimental research status at home and abroad in recent years was analyzed, and the progress in numerical simulation and experimental research was summarized. Furthermore, the key issues were discussed related to the development of natural-gas supersonic cyclone separation technology in the future that need to be solved urgently. And the following research results were obtained. First, current numerical simulation researches on the supersonic cyclone separators mainly focus on its cyclone flow process, internal condensation process and internal flow process, and have obtained some achievements. Second, domestic experimental researches on the supersonic cyclone separators mainly focus on low-pressure experiments and fall behind in terms of condensation mechanism and separation mechanism of high-pressure natural gas. The following conclusions were reached. First, the curve match between the shrinkage section and the expansion section of supersonic jet and the structurally optimal design and installation position of cyclone are beneficial to gas condensation and gas-liquid separating efficiency improvement. Second, the high-pressure experiment in line with the actual working conditions of natural gas helps to explore the condensation and separation mechanisms of cyclonic gas separation. Third, it is in urgent need to carry out a thorough study to reveal the condensation mechanism and separation process of water and heavy hydrocarbons during the transonic flow of high-pressure natural gas and determine the factors influencing separation performance, so as to provide a theoretical basis for the engineering design and application of natural-gas cyclone separators. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 33

Main heading: Cyclone separators

Controlled terms: Additives - Computer simulation - Condensation - Gases - High pressure engineering - Natural gas - Numerical models - Phase separation - Structure (composition) - Supersonic aerodynamics

Uncontrolled terms: Advantage - Experimental research - Gas dehydrations - Prospect - Working principle

Classification code: 522 Gas Fuels - 651.1 Aerodynamics, General - 723.5 Computer Applications - 802.1 Chemical Plants and Equipment - 802.3 Chemical Operations - 803 Chemical Agents and Basic Industrial Chemicals - 921 Mathematics - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.07.013

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

26. Authigenic embrittlement of marine shale in the process of diagenesis

Accession number: 20183905863710

Authors: Liu, Honglin (1); Guo, Wei (1); Liu, Dexun (1); Zhou, Shangwen (1); Deng, Jixin (2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) Chengdu University of Technology, Chengdu; Sichuan; 610059, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 5**Issue date:** May 25, 2018**Publication year:** 2018**Pages:** 17-25**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Studies on the origin of shale brittleness are of great significance to understanding shale gas accumulation laws. The current studies, however, mostly focus on the improvement of shale brittleness by biological quartz enrichment, but rarely on the recrystallization of quartz in the process of diagenetic evolution. In this paper, a series of researches were carried out on the Lower Silurian Longmaxi Fm marine shale in the Changning block of the Sichuan Basin. Firstly, shale pore, mineral component and bedding characteristics were observed by means of cathodoluminescence (CL), scanning electron microscope (SEM) and so on. Then, the control effects of quartz origin, overpressure environment and diagenetic evolution on shale brittleness were investigated by analyzing the mineral composition and siliceous composition of shale microscopically. Finally, the authigenic embrittlement model of marine shale was put forward and the geological significance of authigenic microcrystalline quartz to the improvement of shale brittleness in the process of diagenesis was illustrated. The following results were obtained. First, during the sedimentation, burial and diagenetic evolution, shale experiences diagenetic changes which help increase quartz content and form concealed fracture networks, thus benefiting the formation of complex flow pathways in later stimulation. Second, organic matters play a positive role in improving shale brittleness in the process of geological evolution. It promotes the formation of authigenic microcrystalline quartz and improves the brittleness of shale. In conclusion, due to the authigenic embrittlement of shale in the process of diagenesis, rock structure is changed, rock strength is enhanced and shale porosity is preserved. Consequently, reservoir space in shale is improved and the enrichment state of shale gas is modified. Therefore, the preservation condition under the control of tectonic movement factors is vital to geological evaluation on shale gas. In addition, marine shale is certainly well brittle after authigenic embrittlement in the process of diagenesis as long as its organic matter content is abundant. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20**Main heading:** Plasticity**Controlled terms:** Biogeochemistry - Biological materials - Biology - Brittleness - Crystallization - Fracture mechanics - Organic compounds - Quartz - Recrystallization (metallurgy) - Scanning electron microscopy - Sedimentology - Shale gas**Uncontrolled terms:** Authigenic - Basin - Changning block - Fracture network - Marine shales - Sichuan - Silurian**Classification code:** 461.2 Biological Materials and Tissue Engineering - 461.9 Biology - 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals - 522 Gas Fuels - 531.1 Metallurgy - 802.3 Chemical Operations - 804.1 Organic Compounds - 931.1 Mechanics - 951 Materials Science**DOI:** 10.3787/j.issn.1000-0976.2018.05.002**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

27. Progress and application prospect of on-site automatic mineral analysis technologies

Accession number: 20183905879908**Authors:** Li, Li (1); Pang, Jiangping (1); Zhai, Ziyi (1)**Author affiliation:** (1) Geological Exploration Development Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 6**Issue date:** June 25, 2018**Publication year:** 2018**Pages:** 46-52**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: As the "Internet+" moves into the development stage of integration operation, the existing on-site mineral analysis technologies cannot satisfy the development demand, and the bottlenecking problems that restrict the development of on-site geological service technologies are more and more prominent, including those in acquisition, interpretation quantification, visualization, sharing, and multi-dimensional performance. In this paper, the development history of mineral analysis technologies was reviewed. Then, their development stages were classified and the characteristics of main technologies in each stage were analyzed. Finally, the progress and application prospect of on-site automatic mineral analysis technologies were studied based on their application results. And the following research results were obtained. First, the development of mineral analysis technologies is divided into three stages, i.e., artificial analysis, semi automatic analysis and automatic analysis. Second, the automatic analysis technologies are quite advantageous in terms of nano-scale rock image acquisition, automatic lithology denomination and description, fast reservoir identification and evaluation and automatic expert interpretation system, and can meet the new demand of the development of mineral analysis technologies in the period of "Internet+" and new service domains and application fields have been developed. Third, new technologies (e.g. RoqSCAN) are advantageous in terms of field use, high speed, multi-dimensional parameter, integrated interpretation and multi-aspect application, and they are widely applied in the fields of fine geological evaluation, engineering optimization and fracturing optimization. These technologies will promote the essential change of production organization mode of on-site geological services (e.g. mud logging) and the expansion of new service domains. And they are expected to play a key technological role in the remote mud logging in the future. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Minerals

Controlled terms: Lithology - Mud logging - Nanotechnology - Optimization - Petroleum reservoir evaluation - Petroleum reservoirs

Uncontrolled terms: Engineering optimization - evaluation - Mineral analysis - Multi-dimensional parameters - Production organizations - QemSCAN - Reservoir identification and evaluations - RoqSCAN

Classification code: 481.1 Geology - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 761 Nanotechnology - 921.5 Optimization Techniques

DOI: 10.3787/j.issn.1000-0976.2018.06.006

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

28. Blocking characteristics of microgel in high-temperature and high-salinity water producing gas reservoirs: An experimental study

Accession number: 20183805830746

Authors: Lin, Renyi (1); Luo, Pingya (1); Sun, Lei (1); Pan, Yi (1); Jiao, Baolei (2)

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Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 69-75

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The effective countermeasures of drainage gas recovery and water blocking for productivity recovery of gas wells in water-bearing high temperature, high salinity (HT/HS) deep gas reservoirs (well depth greater than 5 000 m, temperature 140 and salinity 20×104 mg/L) in the northwestern China, such as THN, S3 and KL cannot be realized by the existing conventional means. In this paper, an acrylamide microgel system WJ-1 that can realize the secondary cross linking in such conditions like high temperature and high salinity was specially developed and screened. Then, a series of experiments were conducted to test its capacity of water shut off, including injection pressure, resistance coefficient, flushing resistance and their influence on the gas-water two-phase permeability. It is experimentally

confirmed that this microgel system WJ-1 after gelling behaves well at high-temperature and high-salinity resistance and can realize in-depth water blocking in deep HT/HS water producing gas reservoirs, such as THN, S3 and KL. After gelling, it can block the water invasion of high-permeability pore passages effectively, and consequently the gas passing capacity is much higher than water passing capacity. It is indicated that the microgel system WJ-1 can, to some extent block water instead of gas. In addition, nuclear magnetic resonance experiment was conducted to study the pore structure characteristics of microgel system WJ-1, and the T2 curves after WJ-1 was injected into the core for blocking were verified. It is shown that its water blocking strength is stronger than its gas blocking strength, which further demonstrated that the microgel system WJ-1 is effective in selective blocking. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Water injection

Controlled terms: Amides - Experiments - Gas permeability - Gases - Gelation - Natural gas well production - Nuclear magnetic resonance - Petroleum reservoirs

Uncontrolled terms: Blocking strength - Gas reservoir - High salinity - Microgel - Selective blocking

Classification code: 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 612.1 Internal Combustion Engines, General - 802.3 Chemical Operations - 804.1 Organic Compounds - 901.3 Engineering Research - 931.2 Physical Properties of Gases, Liquids and Solids

Numerical data indexing: Size 5.00e+03m

DOI: 10.3787/j.issn.1000-0976.2018.03.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

29. A new interpretation mode for pre-Carboniferous paleo-geomorphology of the Jingbian Gas Field, Ordos Basin

Accession number: 20183905876127

Authors: Zhao, Jiyong (1, 2); Liu, Haifeng (1, 2); Shi, Ziwei (1, 2); Xie, Shan (1, 2); He, Liu (1, 2); Wu, Yong (1, 2); Qiao, Bo (1, 2)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (2) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: April 25, 2018

Publication year: 2018

Pages: 53-58

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In recent years, due to the existing interpretation methods of paleo-geomorphology, many exploration and development wells deployed in the Jingbian Gas Field, Ordos Basin witnessed failures. Besides, the accuracy of 2D seismic reservoir prediction dropped to below 70%. Consequently, the natural gas exploration in this area is restricted. In this paper, both advantages and disadvantages of the existing paleo-geomorphology restoration methods were analyzed comprehensively. Then, a quantitative paleo-geomorphology restoration method considering the influence of paleo-structure was developed according to the basic principles of impression method and residual thickness method, combined with the drilling and logging data. This method was applied to paleo-geomorphology restoration and erosion groove reinterpretation in the Jingbian Gas Field. The following results were obtained. First, the groove interpretation mode for the Lower Paleozoic reservoirs in this area is modified from the previous mode of "east-west large erosion grooves and north-south capillary grooves" into the new one of "coexistence of east-west erosion grooves and local erosion pits". Second, compared with the results predicted by the existing methods, the proposed method reveals that the main erosion grooves of Lower Paleozoic is 1/2 shorter in the direction of east-west and the development area capillary grooves is smaller and locally replaced by pits of radius of 1-15 km. Third, the reinterpretation results indicate that the gas-bearing area of Lower Paleozoic gas reservoirs in the Jingbian Gas Field can be increased by 305 km², where it is expected that an annual gas productivity of 4.5×10⁸ m³ can be constructed. Based on these

results, 30 wells were deployed in the originally interpreted grooves during the period from 2016 to 2017. So far, 8 wells have been drilled, among which the Ordovician Ma51+2 gas reservoirs are well preserved in 7 wells, and an average absolute open hole flow of $14.3 \times 10^4 \text{ m}^3/\text{d}$ is realized in 5 wells. It is demonstrated that the new method can quantitatively characterize the paleo-geomorphology accurately and increase the reservoir prediction accuracy. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Petroleum prospecting

Controlled terms: Erosion - Gas industry - Gases - Geomorphology - Infill drilling - Landforms - Metamorphic rocks - Oil bearing formations - Oil field development - Petroleum reservoirs - Restoration

Uncontrolled terms: Capillary groove - Gas fields - Lower Paleozoic - Majiagou formation - Ordos Basin - Quantification - Strata denudation

Classification code: 481.1 Geology - 481.1.1 Geomorphology - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels

Numerical data indexing: Area $3.05 \times 10^8 \text{ m}^2$, Percentage $7.00 \times 10^1 \%$, Size $1.00 \times 10^3 \text{ m}$ to $1.50 \times 10^4 \text{ m}$

DOI: 10.3787/j.issn.1000-0976.2018.04.005

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

30. Characteristics and geological implications of rare earth elements in black shale in hydrothermal sedimentation areas: A case study from the Lower Cambrian Niutitang Fm shale in central and eastern Guizhou

Accession number: 20183905863713

Authors: Jia, Zhibin (1, 2, 3); Hou, Dujie (1, 2, 3); Sun, Deqiang (4); Jiang, Yuhuan (1, 2, 3); Zhao, Zhe (1, 2, 3); Zhang, Ziming (1, 2, 3); Hong, Mei (1, 2, 3); Chang, Zhe (1, 2, 3); Dong, Licheng (1, 2, 3)

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Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 44-51

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In this paper, the Lower Cambrian Niutitang Fm shale in Guizhou was taken as an example to figure out the relationship between hydrothermal sedimentation and high-quality source rock development. Firstly, 22 samples taken from 5 sections in Guizhou (i.e. Lianxing-cun section in Bijie, Wenshui-cun section in Guiyang, Zhongnan-cun section in Zunyi, and Yangtiao-cun section and Jiumen-cun section in SE Guizhou) were tested for major elements and rare earth elements (REEs), in order to identify the characteristics of REEs under the effect of hydrothermal sedimentation. Then, the hydrothermal activity intensity and the sedimentary genesis of black shale were distinguished according to the REE characteristics. Finally, combined with total organic carbon (TOC) content, the relationship between hydrothermal sedimentation and high-quality source rocks was discussed. The following results were obtained. First, the deposition at the bottom of the Niutitang Fm is jointly controlled by terrestrial input, marine deposition and hydrothermal activity. The light and heavy REEs are obviously differential in the vertical direction. The heavy REEs are enriched at the bottom, while the light ones are enriched at the top. Extremely low REE content is only observed in the Yangtiao-cun section with the strongest hydrothermal activity. Second, there are two hydrothermal activity centers near the Yangtiao-cun and Zhongnan-cun sections, respectively. The influential intensity of hydrothermal activity increases from the west to the east in the study area, and the coverage of hydrothermal sedimentation intends to extend southeastwards to the Jiumen section. Third, #Eu/Al (europium anomaly/aluminum) and #Y/Al (yttrium anomaly/aluminum) are lower in the black shale formed in normal marine sedimentation and low-temperature hydrothermal sedimentation, and increase

with the hydrothermal sedimentation intensity. And fourth, TOC of source rocks with #Eu greater than 1 is higher. When #Eu/Al and #Y/Al range between 5 and 10, the low-temperature hydrothermal sedimentation is favorable for the enrichment and preservation of organic matters, and plays a positive role in the formation of high-quality source rocks. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 31

Main heading: Shale

Controlled terms: Oil shale - Organic carbon - Rare earth elements - Rare earths - Sedimentation - Temperature

Uncontrolled terms: Early cambrians - Guizhou - High-quality source rocks - Hydrothermal activity - Positive role - Preservation of organic matters - Rare earth elements (REEs) - Total Organic Carbon

Classification code: 512.1 Petroleum Deposits - 547.2 Rare Earth Metals - 641.1 Thermodynamics - 802.3 Chemical Operations - 804.1 Organic Compounds - 804.2 Inorganic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.05.005

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

31. Rock breaking and ROP improvement mechanisms of a new CWD drill bit

Accession number: 20183905879915

Authors: Tian, Jialin (1, 2); Zhu, Zhi (1); Cheng, Wenming (2); Yang, Lin (1)

Author affiliation: (1) School of Mechanical Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) School of Mechanical Engineering, Southwest Jiaotong University, Chengdu; Sichuan; 610031, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to achieve the CWD (coring while drilling) without affecting the ROP (rate of penetration), it is necessary to develop a new CWD drill bit. In this paper, a new CWD drill bit was designed based on previous research achievements and existing design methods, combined with the structure of a CWD drill bit and rock breaking characteristics. Then, its rock breaking performance and ROP were tested in bench tests and field tests. Finally, the test results and the theoretical calculation results were compared and analyzed. And the following research results were obtained. First, a dedicated jet channel is designed inside the new drill bit. The high-pressure drilling fluid that flows out of the jet nozzle generates negative pressure effect while passing through the adsorption channel, to carry the cored rock to the push channel and then to the annulus. Second, the new drill bit is quite remarkable in ROP improvement. The ROP is increased by 5–40% in field tests with a displacement rate of 25 L/s. Third, the rock breaking performance of the new drill bit in laboratory tests and field tests is coincident with the theoretical calculation results, verifying its reliability. It is concluded that the new drill bit has the effect of "entraining the lower cuttings and pushing the upper cuttings" in the process of rock breaking and it can reduce the repeated cutting breaking rate and significantly improve the ROP and efficiency. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Infill drilling

Controlled terms: Bits - Drilling - Drilling fluids - Drills - High pressure effects - Rocks - Testing

Uncontrolled terms: Dedicated jet channel - Negative pressures - Rate of penetration - Rock breaking - While drillings - Working mechanisms

Classification code: 511.1 Oil Field Production Operations - 603.2 Machine Tool Accessories

DOI: 10.3787/j.issn.1000-0976.2018.06.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

32. Low-rank coalbed methane gas pooling in china: characteristics and exploration orientation

Accession number: 20183905879904

Authors: Sun, Fenjin (1); Tian, Wenguang (1); Chen, Zhenhong (1); Sun, Bin (1); Yang, Minfang (1); Sun, Qiping (1); Qi, Ling (1); Zhang, Yongxue (2); Wu, Bei (3)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) Well Testing Company, CNPC Bohai Drilling Engineering Co., Ltd, Langfang; Hebei; 065007, China; (3) No.4 Gas Production Plant, PetroChina Huabei Oilfield Company, Langfang; Hebei; 065007, China

Corresponding author: Tian, Wenguang(tianwg69@petrochina.com.cn)

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Document type: Journal article (JA)

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Number of references: 33

Main heading: Petroleum prospecting

Controlled terms: Biogas - Coal - Coal bed methane - Coal deposits - Gases - Geological surveys - Geology - Methane - Petroleum reservoir evaluation

Uncontrolled terms: Accumulation - Challenge - China - Deep strata - Favorable - Low rank coals - Origin - Reservoiring

Classification code: 481.1 Geology - 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 524 Solid Fuels - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.06.002

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

33. A gas well killing process without pressure release based on the fuzzy-ball fluid piston technology

Accession number: 20182905565435

Authors: Li, Zhi (1); Wei, Panfeng (2); Lü, Jian (1); Lu, Bing (1); Niu, Zhimin (1); Fan, Jingjing (3)

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Publication year: 2018

Pages: 90-96

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Compared with mechanical well killing technologies, the fluid based well killing technology is more advantageous with a simple process, high safety and controllable costs so it has gradually become a common well killing technology for the workover of gas wells. So far, however, its construction technologies have not been researched systematically. In this paper, a technical idea of well killing and workover operation without pressure release based on the fuzzy-ball fluid piston technology was proposed after the research results of well killing technologies used in domestic workover operation were analyzed and summarized. Then, a series of studies were conducted from the aspects of dosage calculation, pumping mode selection, pumping process design and flowback pattern selection of fuzzy-ball fluid in gas wells. Finally, comparative analysis was carried out based on field application. And the following research results were obtained. First, calculate the height of fuzzy-ball fluid piston and its viscosity at a low shear rate based on the internal structure force required to balance the maximum buoyancy of the bubble in the wellbore, and accordingly determine the properties of the fluid that is prepared on site. Second, calculate the volume of fuzzy-ball fluid to keep the hydrostatic column pressure in the wellbore according to the demand for formation pressure balance, with an additional pressure value of 3-5 MPa for safety. Third, pump the water pad fluid with a liquid column height of 500 m, improve the pumping efficiency by wetting string and borehole wall, and increase the flowback efficiency through the formation of a slurry mixture section of low-viscosity and low internal structure force with the fuzzy-ball fluid. Fourth, select the pumping mode of positive/reverse circulation according to the connection state and resistance to pressure of strings. Fifth, after the workover, select direct gas lift or gel-breaking gas lift for production recovery according to the depletion degree of formation energy in a gas well. This technological process was practically applied to three gas wells in NW and SW China. Among them, two wells recover to the previous production rate after continuous gas lift for 2-3 days. It is concluded that this technology can well solve the problems in the process of conventional pressure release, such as poor safety and productivity waste, and shorten the operation cycle of gas well killing. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Natural gas well production

Controlled terms: Boreholes - Gas lifts - Gases - Natural gas - Natural gas wells - Oil field equipment - Pistons - Process design - Pumps - Recovery - Viscosity - Well workover

Uncontrolled terms: Downhole operation - Fuzzy balls - Pressure release - Reservoir damage - Well killing - Workover

Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 612.1.1 Internal Combustion Engine Components - 618.2 Pumps - 631.1 Fluid Flow, General

Numerical data indexing: Age 5.48e-03yr to 8.22e-03yr, Pressure 3.00e+06Pa to 5.00e+06Pa, Size 5.00e+02m

DOI: 10.3787/j.issn.1000-0976.2018.02.012

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

34. Technology series for cost reduction and efficiency improvement in the development of the Sulige Gas Field, Ordos Basin

Accession number: 20182905565430

Authors: Li, Jinbu (1, 2); Ma, Zhixin (1, 2); Zhang, Ji (1, 2); Fu, Bin (1, 2); Bai, Yuqi (1, 2); Huang, Wenfang (1, 2); Feng, Min (1, 2)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (2) National Engineering Laboratory for Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China

Corresponding author: Ma, Zhixin(mzx_cq@petrochina.com.cn)

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Pages: 51-58

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: To cope with the new requirements of domestic environmental protection and the severe situation of global oil price fluctuating at the low level, the PetroChina Changqing Oilfield Company conducted a series of geology and development technology researches in the Sulige Gas Field in the Ordos Basin. Firstly, the reservoirs of Upper Paleozoic fluvial sandstone gas reservoirs in this field were quantitatively characterized by performing seismic and reservoir configuration analysis. Then, hydrocarbon accumulation mechanisms and main control factors were analyzed comprehensively and the reservoirs of Lower Paleozoic marine carbonate gas reservoirs were evaluated. And thus, the horizontal-well development technology for tight sandstones was improved in three aspects, i.e., well deployment, trajectory design and geosteering. Besides, the well deployment technology for large well group and the tridimensional development technology for Upper and Lower Paleozoic gas reservoirs with multiple gas bearing series of strata were developed. The following results were obtained based on the implementation effects of above mentioned series of exploration and development technologies in the Sulige Gas Field. First, the area favorable for new productivity construction of Upper Paleozoic gas reservoirs is 150 km², and the favorable gas bearing area selected in the Lower Paleozoic gas reservoirs is 450 km². Second, the improvement of horizontal-well development technology increases the implementation effects of horizontal wells in Upper Paleozoic gas reservoirs. The average effective reservoir drilling rate of the horizontal wells drilled in 2016 is above 60%, and average AOF of production test is about 45×10⁴ m³/d. Third, the tridimensional development technology for Upper and Lower Paleozoic gas reservoirs increases significantly the producing degree of natural gas reserves and the single well production rate. Fourth, the scale application of large well group development technology reduces average land area covered by each well by 49.9% and cuts down the average construction cycle per well by 10 days. Besides, it is convenient for the production management of gas wells and the alleviation of environment pollution. It is concluded that this series of technologies provide the technical support for the cost reduction and efficiency improvement of the Sulige Gas Field, as well as the reference for similar gas fields. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Oil field development

Controlled terms: Cost reduction - Efficiency - Environmental technology - Gas industry - Gases - Geochronology - Horizontal wells - Infill drilling - Marine engineering - Metamorphic rocks - Natural gas - Natural gas well production - Natural gas wells - Oil bearing formations - Oil wells - Petroleum reservoirs - Proven reserves - Sandstone

Uncontrolled terms: Cost reduction and efficiencies - Multiple layers - Oil Prices - Ordos Basin - Sulige gas field - Tight sandstone gas - Tridimensional development - Well group

Classification code: 454 Environmental Engineering - 481.1 Geology - 482.2 Minerals - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 675 Marine Engineering - 913.1 Production Engineering

Numerical data indexing: Age 2.74e-02yr, Area 1.50e+08m², Area 4.50e+08m², Percentage 4.99e+01%, Percentage 6.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.02.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

35. Characteristics and exploration direction of the Middle Permian carbonate reservoirs in the Longmenshan mountain areas, western Sichuan Basin

Accession number: 20182905565428

Authors: Zhang, Benjian (1, 2); Xie, Jirong (1); Yin, Hong (1); Hu, Xin (1); Wang, Yufeng (1); Yang, Xun (1, 2); Pei, Senqi (1, 2)

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In recent years, high-yield industrial gas flows have been obtained from the Permian Qixia-Maokou strata successively in Wells ST1 and LT1 in the Longmenshan mountain areas in the western Sichuan Basin, and a good gas exploration prospect is presented. To further understand the reservoir property of natural gas accumulation strata in this area, we analyzed the reservoir characteristics of Qixia and Maokou Fms in this area and their main control factors macroscopically and microscopically based on abundant surface outcrops and drilling data. Then, combined with the characteristics of developed gas reservoirs, favorable natural gas exploration zones were evaluated comprehensively. And the following research results were obtained. First, the microfacies of platform marginal banks are developed in the front areas of northern section and southern sections of Longmenshan during the sedimentation of Middle Permian strata, so it is favorable for the development of scale reservoirs. Second, the Middle Permian reservoirs are mainly of fractured-vuggy-porous type and porous-fractured-vuggy type. The former is often occurred in the Qixia Fm while latter is mostly in the Maokou Fm. Third, scale development of Middle Permian reservoirs is mainly dominated by sedimentary microfacies, dolomitization, dissolution and structure fracturing. Among them, sedimentary microfacies are the foundation of scale reservoir development, dolomitization and dissolution improves the seepage capacity of reservoirs and structure fracturing promotes the scale reworking of dissolution. It is concluded that the ZhongbaShuanyushi platform marginal bank area in the northern section of Longmenshan will be the most favorable gas exploration zone, the Lianhuashan-Pingluoba platform marginal bank area in the southern section of Longmenshan will be the secondary, and the JiulongshanLaoguanmiao and Dayi-Daxingchang intra-platform banks will be the favorable zones for the exploration of large karst fractured-vuggygas reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Petroleum prospecting

Controlled terms: Dissolution - Fracture - Gases - Geological surveys - Landforms - Natural gas - Petroleum reservoirs - Sedimentology

Uncontrolled terms: Control factors - Fractured-vuggy-porous type - Longmenshan - Permian - Porous-fractured-vuggy type - Reservoir characteristic - Sichuan Basin - West

Classification code: 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 802.3 Chemical Operations - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.02.005

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

36. Vibration characteristics of double-elbow fracturing manifold considering fluid-solid interaction

Accession number: 20182905565476

Authors: Zhu, Xiaohua (1); Zeng, Yunyi (2); Chen, Bo (3); Tao, Haoran (4)

Author affiliation: (1) School of Mechanical Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Sinopec Guangyuan Natural Gas Purification Co., Ltd., Guangyuan; Sichuan; 628400, China; (3) Sinopec Zhongyuan Oilfield Downhole Service Company, Puyang; Henan; 457162, China; (4) Material Supply Branch of PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China

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Publication year: 2018

Pages: 95-101

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: During the high-pressure fracturing operations, the elbow connecting the fracturing truck with the interflow manifold is susceptible to fatigue damage due to the vibration of the manifold, thereby leading to engineering disasters. It is necessary to minimize the vibration of the manifold. In this paper, the vibration of elbows under high pressure was discussed. First, the motion equation of high-pressure elbows was inferred based on the fluid-solid interaction (FSI). Friction coupling factors were introduced into the hydrodynamic model and solid motion model of the elbow in

a fluctuation flow, and the ANSYS Workbench and fluent were used for simulation computation. Then, the simulation method was verified by field data. On this basis, the impacts of the connection angle, wall thickness, curvature radius and other parameters of a double elbow on its intrinsic frequency were analyzed. The results show that the connecting angle of the double elbow has significant impacts on its intrinsic frequency, which presents an approximately linear increase with the increase of its internal diameters and a decrease with the increase of its curvatures. In conclusion, the double elbow with a connecting angle of 75°-105° may display an outstanding performance with the vibration reduced at most by about 30%. Due to the role of FSI, the intrinsic frequency of the double elbow increases in an approximately linear manner with the increases of its internal diameters. When the fracturing operations involve a pressure of 60 MPa or so, the fracturing pipes with a diameter of 101.4 mm (4 in) shall be used. Additionally, in the case of moderate vibration frequency on site and the ID of 70 mm, the curvature radius of the elbow shall be maintained around 160 mm. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Vibration analysis

Controlled terms: Couplings - Disasters - Equations of motion - Finite element method - Flow interactions - Fracture - High pressure engineering - Natural frequencies

Uncontrolled terms: Connecting angle - Curvature radii - Double elbow - Fluid solid interaction - High pressure - Internal diameters - Vibration characteristics

Classification code: 631.1 Fluid Flow, General - 921.2 Calculus - 921.6 Numerical Methods - 951 Materials Science

Numerical data indexing: Percentage 3.00e+01%, Pressure 6.00e+07Pa, Size 1.60e-01m, Size 7.00e-02m

DOI: 10.3787/j.issn.1000-0976.2018.01.012

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

37. Buckling behaviors of tubing strings in HTHP ultra-deep wells

Accession number: 20182905565475

Authors: Lian, Zhanghua (1); Mou, Yisheng (1); Liu, Yang (1); Xu, Dingjiang (1)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

Corresponding author: Mou, Yisheng(479824223@qq.com)

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Document type: Journal article (JA)

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Abstract: Classical theoretical formulas for the buckling of pipe strings derived by previous researchers may not completely and accurately describe the non-uniform or incomplete sinusoidal buckling or helical buckling forms around the bottom of tubing strings in HTHP ultra-deep gas wells. In this paper, a finite element mechanical model for analyzing the buckling behaviors of tubing strings in HTHP ultra-deep wells was established by using the software ANSYS. With an ultra-deep well in the Tarim Oilfield as an example, systematic analyses were conducted on the buckling of tubing strings with regard to buckling configuration, horizontal displacement, tubing-casing contact pressure. The results are revealed in two aspects. First, the proposed finite element analysis model for the buckling behaviors of tubing strings in HTHP ultra-deep wells can be used to highlight buckling configurations throughout the entire hole. It can be seen that the interval between the central point and the packer under complicated mechanical conditions is in inhomogeneous, or incomplete sinusoidal or helical buckling forms. Second, in such cases with an axial pressure of 205 kN at the bottom of the tubing string, the contact sections at the top and bottom of the string may experience self-locking due to sinusoidal and helical buckling, respectively. The self-locking phenomenon may lead to permanent buckling of such strings. In conclusion, the proposed model can be used to highlight buckling configurations, contact pressures and frictions during tubing-casing buckling. The model provides a reliable technique and foundation for analyses related to buckling configurations, friction damages, failures and relevant prevention measures. To prolong the service life of tubing strings, it is necessary to apply suitable lifting forces, enlarge the

dimensions of tubing strings at bottom, promote wellhead pressures or properly reduce productivities. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Finite element method

Controlled terms: Deformation - Friction - Locks (fasteners) - Tubing

Uncontrolled terms: Buckling behaviors - Contact Mechanics - Helical buckling - Selflocking - Tubing string - Ultra-deep wells

Classification code: 619.1 Pipe, Piping and Pipelines - 921.6 Numerical Methods

Numerical data indexing: Force 2.05e+05N

DOI: 10.3787/j.issn.1000-0976.2018.01.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

38. Controlling measures for the hidden dangers caused by the vibration of gas compressor sets

Accession number: 20191306691392

Title of translation:

Authors: Zhao, Jinsheng (1, 2); Li, Pan (3); Ma, Yuteng (3); Wang, Xuanyi (4, 5)

Author affiliation: (1) College of Petroleum Engineering, Xi'an Shiyou University, Xi'an; Shaanxi; 710065, China; (2) Shaanxi Key Laboratory of Advanced Stimulation Technology for Oil & Gas Reservoirs, Xi'an; Shaanxi; 710065, China; (3) No.2 Gas Processing Plant, Sulige Gas Field, PetroChina Changqing Oilfield Company, Uxin Qi; Inner Mongolia; 017300, China; (4) Oil and Gas Technology Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (5) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China

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Publication year: 2018

Pages: 128-133

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Reciprocating natural gas compressor sets have a widespread problem of excessive vibration, which leads to major hidden dangers to safe production. In this paper, the No.2 Gas Processing Plant of the Sulige Gas Field, operated by the PetroChina Changqing Oilfield Company, was taken as an example to explore the main reasons and controlling measures for such a problem. Based on the energy conservation law, the vibration of the operating compressor sets was studied systematically from the aspects of foundation soil and compressor skid components. Then, a compressor over-vibration control scheme was put forward from the single one to the six-compressor resonance control and from the compressor body to foundation control. And the following research results were obtained. First, the main reason for the excessive vibration of compressors is the resonance of six compressor foundations, and the specific reasons include poor soil compaction around the compressor foundation and process piping, gas pulsation, pipeline resonance and compressor body vibration. Second, by taking some controlling measures, including excavating and tamping the soil around the compressor foundation and process piping, reinforcing the equipment, controlling gas flow, optimizing the startup program and adjusting compressor inlet manifold, the vibration value of the compressor can be kept in the range of standard value, the failure rate is reduced significantly, and the operating efficiency of compressor sets is thus improved. In conclusion, these controlling measures for compressor over-vibration can provide a reference for the safe operation of other natural gas processing plants. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Gas compressors

Controlled terms: Compressibility of gases - Compressors - Control engineering - Failure analysis - Flow of gases - Foundations - Gas industry - Gas plants - Gas producers - Gases - Natural gas - Natural gasoline plants - Pulsatile flow - Resonance - Soil conservation - Soil mechanics - Soils - Vibration analysis

Uncontrolled terms: Antivibration - Changqing oilfield companies - Energy conservation law - Gas processing plant - Gas pulsations - Natural gas processing plants - Systematic analysis - Vibration

Classification code: 483.1 Soils and Soil Mechanics - 483.2 Foundations - 513.2 Petroleum Refineries - 522 Gas Fuels - 618.1 Compressors - 631.1 Fluid Flow, General - 631.1.2 Gas Dynamics - 931.1 Mechanics - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.12.016

Compendex references: YES

Database: Compendex

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39. Enrichment laws and scale effective development of shale gas in the southern Sichuan Basin

Accession number: 20185106260088

Title of translation:

Authors: Ma, Xinhua (1)

Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

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Document type: Journal article (JA)

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Abstract: Based on the newest understandings of geological assessment and new progresses in engineering technologies in the development of shale gas rich in the southern Sichuan Basin, this paper analyzed the shale gas enrichment laws and the key factors of its commercial production, discussed the scale and efficient development modes, and clarified the further developing orientation. The following findings were concluded. (1) The Lower Silurian Longmaxi shale is the sweetest spot in this study area with a low density and a high uranium/ thorium (U/Th) ratio, TOC content, quartz content free gas content. Besides, its distribution laws are mainly controlled by the sedimentary facies of deep water shelf. (2) The overpressured zones away from the ancient (present) erosion zones and large faults, mainly controlled by multi-stage tectonic evolution, belong to the most favorable sweet spots not only because there are well-developed organic matters and pores but the produced gas there is mainly of secondary cracking retention oil. (3) Layout, drilling, completion (fracturing) and management of wells will be essential to achieve high outputs in the shale gas production. (4) The existing main technologies have helped achieve efficient development of quality shale gas resources underground less than 3 500 meters in such national shale gas demonstration zones as Changning-Weiyuan, Zhaotong, etc. Also, there shows a good potential of shale gas resources in those shallower strata and the strata with the burial depth of 3 500-4 000 m. In conclusion, with the help of continuous progress in technologies, an annual shale gas production rate of 40 billion cubic meters will be possibly achieved in this study area. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Natural gas well completion

Controlled terms: Energy resources - Gases - Petroleum deposits - Shale gas

Uncontrolled terms: Enrichment law - High productivity - Resource potentials - Scale effective development - Sichuan Basin - Silurian - South - Sweet spot

Classification code: 512.1 Petroleum Deposits - 512.2.2 Natural Gas Deposits: Development Operations - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues

Numerical data indexing: Size 3.50e+03m, Size 3.50e+03m to 4.00e+03m

DOI: 10.3787/j.issn.1000-0976.2018.10.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

40. Optimal selection and effect evaluation of re-fracturing intervals of shale-gas horizontal wells

Accession number: 20184706088034

Title of translation:

Authors: Li, Yanchao (1, 2); He, Yunbin (3); Xiao, Jianfeng (1, 2); Shi, Xiaozhi (1, 2); Feng, Qiang (4); Yin, Congbin (1, 2)

Author affiliation: (1) Downhole Service Company, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610052, China; (2) National Energy Shale Gas R&D Center, Chengdu; Sichuan; 610052, China; (3) CNPC Oilfield Technology Service Company, Beijing; 100007, China; (4) Shale Gas E&D Project Department, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610052, China

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Document type: Journal article (JA)

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Abstract: The monitoring results of production logging show that almost one third of perforation clusters produce no or less gas after volumetric fracturing is initially applied in shale gas reservoirs. Besides, the production decline after the commissioning is commonly faster. In this paper, a fracture network prediction model and a fracturing well productivity prediction model were established based on microseismic interpretation data and hydraulic fracture network propagation results. After petrophysics, microseism, production performance were taken into consideration comprehensively, shale re-fracturing development potential evaluation index (RDPEI) was proposed. Then, a re-fracturing design and evaluation method was developed and targeted interval selection and evaluation was realized and applied on site. And the following research results were obtained. First, due to the heterogeneity of natural fractures, hydraulic fracture networks are more different, so an obvious "dead gas zone" can be easily formed and its re-fracturing potential is high. Second, the initial hydraulic fracture network is more affected by natural fractures. The main part of a fracture network propagates along the direction of maximum horizontal major stress, the fractures in regional stimulated intervals propagate in the form of double wing, and the length of a liquid swept fracture network is 52-70% of seismic interpretation result. Third, the RDPEI model avoids the limitations of single factor analysis and realizes the quantitative prediction on three types of indexes of recoverability, compressibility and re-fracturing. Fourth, re-fracturing of the case well is remarkable in stimulation effect. Its shale gas productivity is increased by 38.9%, and its cumulative gas production in one year is increased by 62.5%. In conclusion, re-fracturing is an effective and feasible method for improving the single-well ultimate recovery reserves of shale gas. This method provides a theoretical and technical support for the selection and effect evaluation of re-fracturing intervals in shale-gas horizontal wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Fracture

Controlled terms: Crack propagation - Forecasting - Gases - Horizontal wells - Hydraulic fracturing - Petroleum reservoir evaluation - Petroleum reservoirs - Petrophysics - Productivity - Proven reserves - Seismology - Shale gas - Site selection - Swept wings - Well stimulation

Uncontrolled terms: Fracture network - Microseismic - Production declines - Recoverable reserves - Refracturing

Classification code: 484.1 Earthquake Measurements and Analysis - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 652.1 Aircraft, General - 951 Materials Science

Numerical data indexing: Percentage 3.89e+01%, Percentage 5.20e+01% to 7.00e+01%, Percentage 6.25e+01%

DOI: 10.3787/j.issn.1000-0976.2018.07.008

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

41. Characteristics and rational development indexes of the basement gas reservoir in the Dongping Block, Qaidam Basin

Accession number: 20185006230375

Title of translation:

Authors: Cheng, Lihua (1); Meng, Dewei (1); Yang, Yun (2); Wei, Yunsheng (1); Ji, Guang (1); Qi, Yadong (1); Luo, Na (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) Research Institute of Exploration and Development, PetroChina Qinghai Oilfield Company, Dunhuang; Gansu; 736202, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: August 25, 2018

Publication year: 2018

Pages: 69-74

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The basement gas reservoir in the Dongping Block of the Qaidam Basin is a metamorphic gas reservoir and it is the first basement gas reservoir discovered in China. Its natural gas productivity was up to 12×10^8 m³/a in 2015, and then its gas production rate declined greatly as the effect of water invasion got stronger. There are few development examples available at home and abroad and the static and dynamic characteristics of basement gas reservoirs have not been investigated systematically. For providing technical references for the efficient development of basement gas reservoirs, the reservoir characteristics were evaluated further and the production histories of gas wells were traced and analyzed deeply in this paper. Then, combined with the numerical simulation technology and gas reservoir engineering analysis, the well type, well pattern and rational development indexes suitable for this basement gas reservoir were determined. And the following research results were obtained. First, the basement gas reservoir in the Dongping Block is tight and fractures and local dissolved pores are developed. It is characterized by low porosity, high permeability and large permeability range. It is vertically divided into weathering fracture zone, fracture development zone and tight zone. It is a typical integrated structural gas reservoir with active bottom water. Second, the single-well production rate is high and the pressure drop rate is low in the early stage. In the later stage, however, the production rate declines greatly under the effect of water invasion and even shut down due to water flooding. Third, the arrangement shall be made according to the principle of overall evaluation, high yield with few wells and balanced production. It is necessary to adopt the combined well pattern with horizontal wells in the high position and vertical wells in the edge. Fourth, the rational gas production rate of vertical wells shall be between 3.2×10^4 m³/d and 7.5×10^4 m³/d, and that of horizontal wells shall be between 12.4×10^4 m³/d and 25.6×10^4 m³/d. The rational production rate of gas wells shall be 1/3-1/4 of absolute open flow and the gas recovery rate of this gas reservoir shall be controlled below 3%. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Petroleum reservoir evaluation

Controlled terms: Buildings - Fracture - Gas engineering - Gases - Horizontal wells - Metamorphic rocks - Natural gas well production - Natural gas wells - Petroleum reservoirs - Weathering

Uncontrolled terms: Dongping Block - Gas reservoir - Production performance - Qaidam basin - Rational development index - Well patterns

Classification code: 402 Buildings and Towers - 512 Petroleum and Related Deposits - 522 Gas Fuels - 951 Materials Science

Numerical data indexing: Percentage 3.00e+00%

DOI: 10.3787/j.issn.1000-0976.2018.08.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

42. Disaster-causing mechanism of surrounding rock gas flowing underground in the Huangling coal mine and prevention measures

Accession number: 20191006600878

Title of translation:
Authors: Zhao, Jizhan (1); Zhang, Qun (2); Zheng, Kaige (1); Li, Chuan (2); Chen, Dongdong (1)

Author affiliation: (1) Xi'an Research Institute of China Coal Technology & Engineering Group, Xi'an; Shaanxi; 710054, China; (2) Huangling Mining Co., Ltd., Huangling; Shaanxi; 727307, China

Corresponding author: Zhang, Qun(zhangqun@cctegxian.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: November 25, 2018

Publication year: 2018

Pages: 114-121

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the mining process of coal mines (e.g. No.1 Huangling Coal Mine) in the Huangling mining area along the southern margin of the Ordos Basin, a great amount of gas flows from the surrounding rocks underground, leading to mining suspension and serious threat to the safe production of coal mines. In order to reveal the origin and disaster-causing mechanism of flowing gas, the areal and sectional distribution characteristics of sandstone reservoirs of surrounding rock gas were investigated, the genetic type and origin of abnormal disaster-causing surrounding rock gas in the study area were studied, and the disaster-causing mechanism of the abnormal flowing of surrounding rock gas was analyzed based on the supplementary exploration and drilling data of surface drilling and the geochemical parameter test data of surrounding rock gas by means of geochemical characteristic analysis of gas sample, thermal evolution history simulation, source rock comparison, migration pathway identification and other methods. Then, the prevention and control mode of multi-source comprehensive three-dimensional extraction with the extraction of roof and floor sandstone as the dominant part was established. And the following research results were obtained. First, the flowing of surrounding rock gas underground in this area is abrupt, hidden, concentrated and considerable, and the gas is mainly composed of methane and is mainly derived from surrounding rocks. Second, the surrounding gas in the roof and floor is mainly the pyrogenic oil-type gas associated with crude oil. And its source rocks are sapropel-type principal source rocks, e.g. Chang 7 Member of Yanchang Fm, Upper Triassic, and its migration pathway is acted by the NE trending basement faults formed by the Yanshan movement and the large-scale vertical fractures around them. Third, the main reservoir sandstones of oiltype gas are distributed in the pattern of zoning controlled by structure and lithology jointly. Fourth, the surrounding rock oil-type gas is stored in a free state in sandstones and it flows out through mining-induced fractures, so the prevention and control mode of multi-source comprehensive three-dimensional extraction is adopted to control the disaster caused by surrounding rock gas with a good effect. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Petroleum prospecting

Controlled terms: Coal - Coal mines - Disaster prevention - Disasters - Extraction - Floors - Flow of gases - Fracture - Gases - Geochemistry - Infill drilling - Lithology - Metamorphic rocks - Mine roof control - Roofs - Sandstone

Uncontrolled terms: Genetic type - Late Triassic - Mining induced fracture - Ordos Basin - Prevention and controls - Source rocks - Surrounding rock

Classification code: 402 Buildings and Towers - 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals - 502.1 Mine and Quarry Operations - 503.1 Coal Mines - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 524 Solid Fuels - 631.1.2 Gas Dynamics - 802.3 Chemical Operations - 914.1 Accidents and Accident Prevention - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.11.015

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

43. Simulation of effective fracture length of prepad acid fracturing considering multiple leak-off effect

Accession number: 20184706088035

Title of translation:

Authors: Dang, Lurui (1); Zhou, Changlin (2); Huang, Mei (1); Jiang, Desheng (1)

Author affiliation: (1) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Engineering Technology Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610031, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 65-72

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For the purpose of improving the accuracy and effectiveness of acid fracturing design for carbonate reservoirs with developed natural fractures, an acidizing fluid flow and reaction model taking the multiple leak-off effect of natural fracture, wormhole and matrix into account was established according to the liquid phase reaction equilibrium principle and the local reaction equilibrium principle after the dynamic change of fracture geometry in the process of fracture creating by prepad fluid was simulated in the classical pseudo-three dimensional mathematical model of fracture propagation. Then, the acid fracturing stimulation of a case well on site was taken as an example. The newly developed model was used to simulate the filtration process of acidizing fluid in fractures and the dynamic etching morphology of acidic rocks during the acidizing fluid injection of prepad acid fracturing. The effective length of etched fractures was determined by analyzing the concentration change of acidizing fluid along the direction of hydraulic fracture length and the threshold concentration of residual acidizing fluid comprehensively, and then it was compared with the interpretation result of pressure buildup test. And the following research results were obtained. First, in the process of acid fracturing in fractured-porous reservoirs, the acidizing fluid filtration velocity along the direction of fracture length is not constant and the filtration velocity curve fluctuates in a serrated shape. And the acidizing fluid filtration velocity where etched wormholes meet natural fractures is commonly higher than that in matrix. Second, acidizing fluid is lost seriously and the effective distance of acidizing fluid gets short significantly during the acid fracturing of fractured-porous reservoirs. Third, acid fracturing in the verification well is remarkable in blockage removing and stimulation, and its well test interpretation results are consistent with the simulation interpretation results provided by the newly developed mathematical model. It is indicated that this newly developed model is reliable. In conclusion, the mathematical model of prepad acid fracturing which considers multiple leak-off effect is more suitable for acid fracturing simulation of fractured-porous reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Fracture

Controlled terms: Acidization - Etching - Flow of fluids - Hydraulic fracturing - Molecular weight - Porous materials - Reservoirs (water) - Well stimulation - Well testing

Uncontrolled terms: Acid fracturing - Acidizing fluid - Carbonate rock - Effective fracture - Fractured-porous - Natural fracture - Wormhole

Classification code: 441.2 Reservoirs - 512.1.2 Petroleum Deposits : Development Operations - 631.1 Fluid Flow, General - 802.2 Chemical Reactions - 931.3 Atomic and Molecular Physics - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.07.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

44. A dynamic model for the leakage pressure of induced fractures in shale reservoirs

Accession number: 20183805830748

Authors: Zhai, Xiaopeng (1, 2); Ju, Pengfei (3); Xie, Zhitao (3); Lou, Yishan (1); Zhang, Yan (1, 2)

Author affiliation: (1) Lost Circulation Control Division of National Engineering Laboratory of Oil and Gas Drilling Technology//Yangtze University, Wuhan; Hubei; 430100, China; (2) Western Research Institute, Yangtze University, Karamay; Xinjiang; 834003, China; (3) Research Institute of Engineering Technology, PetroChina Xinjiang Oilfield Company, Karamay; Xinjiang; 834003, China

Corresponding author: Lou, Yishan(louys2006@126.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: March 25, 2018

Publication year: 2018

Pages: 81-86

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The current leakage pressure model used for induced fractures can only identify whether fractures are created or not, but cannot analyze the influence of the change of fracture width on the leakage pressure. In this paper, a method for calculating the change of induced fracture width under the effective inner pressure was firstly developed. Then, based on the steady state diffusion equation of bottom hole fluid, a dynamic model for calculating the leakage pressure in the steady state diffusion of fluid in cracks was established considering the influential factors, including loss rate coefficient, fracture width, fluid viscosity and wellbore radius. Finally, the rock mechanic property and loss rate monitored on site in the Jiaoshiba Shale Gas Field, Sichuan Basin, were taken as the parameters to calculate the dynamic change of leakage pressure. And the following research results were obtained. First, the positive pressure difference under the effect of wellbore fluid column pressure and formation pressure is the main reason for the pressure leakage of induced fractures, and it is inadvisable to block the leakage as soon as it is discovered on site, for it can increase the fracture width artificially. Second, the leakage pressure of induced fractures changes dynamically over the time, and fracture width and loss rate increase with the increase of leakage pressure. Third, there is a critical fracture width corresponding to the serious leakage. If the leakage pressure difference is constant, there is a power exponent relationship between the fracture width and the loss rate. Field application effect proves the feasibility of this model. It is concluded that the fracture width can be decreased by controlling the leakage pressure so as to control the pressure leakage of induced fractures in shale reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Fracture

Controlled terms: Boreholes - Diffusion in liquids - Diffusion in solids - Drilling - Drilling fluids - Dynamic models - Equations of state - Gas industry - Infill drilling - Leakage (fluid) - Oil field equipment - Rock mechanics - Shale gas

Uncontrolled terms: Formation pressure - Fracture width - Influential factors - Leakage pressure - Mechanic properties - Mud loss - Steady state diffusion - Steady state diffusion equations

Classification code: 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 522 Gas Fuels - 921 Mathematics - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.03.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

45. Application of prico® liquefaction technology in offshore floating devices

Accession number: 20183905879917

Authors: Zhang, Yuezheng (1); Gai, Jingquan (1); Jiang, Hao (1); Liu, Xiaogang (1)

Author affiliation: (1) Black and Veatch - Beijing Engineering Design Co., Ltd., Beijing; 100022, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: June 25, 2018

Publication year: 2018

Pages: 115-120

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 19

Main heading: Floating liquefied natural gas

Controlled terms: Gas industry - Gases - Liquefaction - Liquefied natural gas - Offshore gas fields - Offshore oil well production - Refrigerants

Uncontrolled terms: Engineering applications - Feed gas composition - Flexibility - Mixed refrigerants - Module design - Operating environment - Operation flexibility - Performance tests

Classification code: 511.1 Oil Field Production Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 523 Liquid Fuels - 802.3 Chemical Operations - 803 Chemical Agents and Basic Industrial Chemicals

DOI: 10.3787/j.issn.1000-0976.2018.06.015

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

46. Key technologies for salt-cavern underground gas storage construction and evaluation and their application

Accession number: 20183905863721

Authors: Wanyan, Qiqi (1, 2, 3); Ding, Guosheng (2, 3); Zhao, Yan (4); Li, Kang (2, 3); Deng, Jingen (1); Zheng, Yali (2, 3)

Author affiliation: (1) China University of Petroleum, Beijing, Beijing; 102249, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (3) CNPC Key Laboratory of Oil & Gas Underground Gas Storage Engineering, Langfang; Hebei; 065007, China; (4) PetroChina West-East Gas Pipeline Company, Shanghai; 200122, China

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 15

Main heading: Underground gas storage

Controlled terms: Caves - Salt deposits - Solution mining - System stability

Uncontrolled terms: Gas storage - Monitoring network - Salt caverns - Site evaluation - Stability evaluation

Classification code: 481.1 Geology - 502.1 Mine and Quarry Operations - 505.1 Nonmetallic Mines - 522 Gas Fuels - 961 Systems Science

DOI: 10.3787/j.issn.1000-0976.2018.05.013

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

47. A new model for forecasting the short-term daily demand of urban natural gas

Accession number: 20183905879919

Authors: Shu, Man (1); Liu, Xialan (2); Xu, Ting (1); Xie, Wenjuan (2); He, Bin (3)

Author affiliation: (1) College of Management Science, Chengdu University of Technology, Chengdu; Sichuan; 610059, China; (2) Natural Gas Economics Research Institute, PetroChina Southwest Oil Gasfield Company, Chengdu; Sichuan; 610031, China; (3) CNPC Daying Gas Co., Ltd., Suining; Sichuan; 629300, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: June 25, 2018

Publication year: 2018

Pages: 128-132

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 16

Main heading: Forecasting

Controlled terms: Errors - Gases - Metadata - Natural gas - Neural networks - Public policy - Regression analysis - Support vector machines - Time series analysis - Weathering

Uncontrolled terms: Date - Forecasting modeling - Green energy - Least Square - Precision - Short term - Vector machines

Classification code: 522 Gas Fuels - 723 Computer Software, Data Handling and Applications - 922.2 Mathematical Statistics - 971 Social Sciences

Numerical data indexing: Percentage 1.42e+00%

DOI: 10.3787/j.issn.1000-0976.2018.06.017

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

48. Migration and distribution of complex fracture proppant in shale reservoir volume fracturing

Accession number: 20183905863715

Authors: Pan, Linhua (1, 2); Zhang, Ye (1, 2); Cheng, Lijun (1, 2); Lu, Zhaohui (1, 2); Kang, Yuanbo (1, 2); He, Pei (1, 2); Dong, Bingqiang (1, 2)

Author affiliation: (1) National Joint Engineering Research Center for Shale Gas Exploration and Development, Chongqing Institute of Geology and Mineral Resources, Chongqing; 400042, China; (2) MLR Key Laboratory of Shale Gas Exploration, Chongqing Institute of Geology and Mineral Resources, Chongqing; 400042, China

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Abbreviated source title: Natur. Gas Ind.

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Pages: 61-70

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 17

Main heading: Proppants

Controlled terms: Flow patterns - Fracturing fluids - Laminar flow - Reservoirs (water) - Shale - Viscosity

Uncontrolled terms: Distribution law - Experimental system - Fluid displacement - Migration and distribution - Migration mode - Proppant - Proppant concentrations - Reservoir volume

Classification code: 441.2 Reservoirs - 511.1 Oil Field Production Operations - 631.1 Fluid Flow, General

DOI: 10.3787/j.issn.1000-0976.2018.05.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

49. Integration and scale application of shale gas exploration and development engineering technologies in Sichuan and Chongqing areas

Accession number: 20182905565433

Authors: Yue, Yanhua (1); Wu, Xianzhu (1); Zhang, Qing (1); Zhao, Han (1); Jiang, Wei (1)

Author affiliation: (1) CNPC Chuanqing Drilling Engineering Company Limited, Chengdu; Sichuan; 610051, China

Corresponding author: Zhao, Han(zhaohan_sc@cnpc.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: February 25, 2018

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Pages: 74-82

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Based on 8 years' exploration and production since the spud in of the first shale gas well in the Changning-Weiyuan national demonstration zone in the Sichuan Basin in 2009, great progress and all-sided development have been achieved in shale gas exploration and development engineering technologies in China. In order to promote scale shale gas development efficiently with high benefits in Sichuan and Chongqing areas, it is of great significance to summarize in time the optimized and integrated support technologies of shale gas exploration and development engineering. And the following research results were obtained. First, 10 principal technology series at the domestic leading level in shale gas well drilling and completion engineering are formed and completed, providing a technical support for a drastic increase of shale gas production. Second, volumetric fracturing support technologies from design to laboratory experiment evaluation and to real time monitoring of fracturing networks based on borehole seismic data are developed, ensuring the implementation effects of shale gas stimulation schemes. Third, simultaneous operation modes are innovatively established, such as drilling-fracturing, drilling-production&transportation and fracturing-production&transportation, and pad arrangement is optimized so that batch, modularized, programmed and integrated operation is realized and the commissioning schedule of shale gas wells is sped up greatly. Fourth, six series of environmental protection and energy saving technologies for shale gas development are developed, and consequently clean and energy saving production of shale gas is realized. Fifth, a technological system with a high-precision 3D seismic prospecting technology as the base is established to provide a basis for the realization of "transparent" gas reservoirs. Sixth, ground gathering technologies are optimized and intellectual and digital management of gas reservoir production and transportation is realized. It is concluded that these support technologies for shale gas exploration and development engineering provide an effective support for the increase of shale gas production of the Changning-Weiyuan shale gas national demonstration zone and they play a guiding and demonstrating role in technological progress and managerial innovation. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Shale

Controlled terms: Demonstrations - Energy conservation - Environmental technology - Fracture - Gases - Geological surveys - Infill drilling - Natural gas well completion - Natural gas well production - Natural gas wells - Petroleum prospecting - Reservoir management - Seismic design - Seismic prospecting - Seismology - Shale gas - Well drilling

Uncontrolled terms: Commissioning schedule - Drilling fracturing - Energy-saving technologies - Exploration and productions - Implementation effects - Large-scale benefit - Production and transportations - Sichuan Basin

Classification code: 408 Structural Design - 454 Environmental Engineering - 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.2 Energy Conservation - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.02.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

50. Effects of polyvinylpyrrolidone with different molecular weights on the formation and growth of tetrahydrofuran hydrate

Accession number: 20183905863723

Authors: Sun, Huicui (1); Wang, Ren (2, 3); Wang, Jianhua (2, 3); Xu, Xianguang (2, 3); Ning, Fulong (1); Guo, Dongdong (1); Li, Rui (1); Zhang, Ling (1, 4); Liu, Tianle (1); Jiang, Guosheng (1)

Author affiliation: (1) Faculty of Engineering, China University of Geosciences, Wuhan; Hubei; 430074, China; (2) CNPC Engineering Technology R&D Company Limited, Beijing; 102206, China; (3) National Engineering Laboratory for Oil & Gas Drilling Technology, Beijing; 10220, China; (4) MOE Engineering Research Center of Rock-Soil Drilling & Excavation and Protection, China University of Geosciences, Wuhan; Hubei; 430074, China

Corresponding author: Zhang, Ling(flyzlingfly@163.com)

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Publication year: 2018

Pages: 125-132

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ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: As a kind of well-performed and widely-used kinetic hydrate inhibitor (KHIs), polyvinylpyrrolidone (PVP) is attractive to many scholars in China and abroad. However, it is still controversial on the hydrate inhibition of PVPs with different molecular weights. In this paper, the formation of tetrahydrofuran (THF) hydrate was experimentally simulated under normal pressure and changing temperature to identify the effects of PVPs with different molecular weights at the same dosage on the formation and growth of THF hydrate. Besides, the influence mechanisms were discussed from three aspects, i.e., macroscopic phenomenon, mesoscopic structure and microscopic mechanism. The following results were obtained. First, the inhibition of PVP on the formation of THF hydrate increases gradually with the increase of molecular weight. Second, PVPs with a molecular weight of 8 000-58 000 have similar weak but stable inhibition on the growth of THF hydrate. PVPs with a molecular weight of 270 000-1 500 000 demonstrate good inhibition on the growth of THF hydrate at the initial stage of hydrate growth, but the average formation rate of THF hydrate is high in the whole process of the experiment. This phenomenon is more obvious at higher molecular weight. Third, the existence of PVP enhances the agglomeration intensity of THF hydrate agglomerates. The research results can be used as valuable reference for the development and application of KHIs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 25

Main heading: Hydrates

Controlled terms: Agglomeration - Enzyme inhibition - Hydration - Mechanisms - Molecular weight - Organic solvents

Uncontrolled terms: Development and applications - Inhibitory - Kinetic hydrate inhibitors - Macroscopic phenomena - Microscopic mechanisms - Polyvinyl pyrrolidone - Tetra-hydrofuran - Tetrahydrofuran hydrate

Classification code: 601.3 Mechanisms - 802.3 Chemical Operations - 803 Chemical Agents and Basic Industrial Chemicals - 931.3 Atomic and Molecular Physics

DOI: 10.3787/j.issn.1000-0976.2018.05.015

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

51. NMR logging activation sets selection and fluid relaxation characteristics analysis of tight gas reservoirs: A case study from the Sichuan Basin

Accession number: 20182905565470

Authors: Zhang, Yun (1); Wu, Jianmeng (1); Zhu, Guozhang (2)

Author affiliation: (1) Sinopec Xinan Oilfield Service Corporation, Chengdu; Sichuan; 610041, China; (2) Geological Exploration and Development Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

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Pages: 49-55

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: With complex lithology and reservoir types, as well as high concealment and heterogeneity, tight reservoirs in the Sichuan Basin involve significant uncertainties in gas-water relationship. Since NMR logging can effectively solve problems related to the multiple results of conventional logging operations, it can be deployed for accurate assessment of the properties of formation fluids. Accordingly, different NMR logging activation sets were assessed in accordance with the specific features of tight reservoirs in the basin. With consideration to NMR logging data obtained under different activation sets and testing data of wells, the optimal NMR logging activation set was identified. Moreover, with relaxation characteristics of rocks, gas and water as theoretical foundations, the T2 gas and water relaxation characteristics were reviewed to highlight the impacts of porosity, pore sizes, fluid properties and other factors of tight reservoirs on T2 horizontal relaxation distribution. According to the research results, D9TWE3 can be seen as the most suitable NMR logging activation set for tight reservoirs in the Sichuan Basin; reservoir tightness is the key influence factor for the distribution of gas/water relaxation in tight clastic reservoirs; generally, in tight sandstone reservoirs, natural gas shows a longer T2 relaxation time than water; in fracture-vug type carbonate reservoirs, the right peak of T2 distribution spectrum of gas layers is frontal, while the right peak in T2 distribution spectrum of water layers is backward. In conclusion, the standards for gas/water relaxation in tight sandstone and carbonate reservoirs in the Sichuan Basin can help effectively determine the physical properties of fluids in tight reservoirs with porosity of 4-10%. Such standards provide reliably technical supports for gas/water identification, reserves estimation and productivity construction in tight reservoirs of the Sichuan Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Proven reserves

Controlled terms: Activation analysis - Carbonates - Carbonation - Chemical activation - Gases - Lithology - Nuclear magnetic logging - Petroleum reservoirs - Pore size - Sandstone - Tight gas - Well testing

Uncontrolled terms: Characteristics analysis - Fluid property - Nmr loggings - Relaxation distribution - Sichuan Basin - Theoretical foundations - Tight sandstone reservoirs - Tight sandstones

Classification code: 481.1 Geology - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 802.2 Chemical Reactions - 804.2 Inorganic Compounds - 951 Materials Science

Numerical data indexing: Percentage 4.00e+00% to 1.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.01.006

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

52. Formation mechanism of fractures in the carbonate reservoir of the 4th Member of Middle Triassic Leikoupo Fm in Longmenshan piedmont, Sichuan Basin

Accession number: 20191006600865

Title of translation:

Authors: Hu, Xiangyang (1); Zhao, Xiangyuan (1); Su, Yaxian (2); Xiao, Kaihua (1); Deng, Meizhou (3); Wang, Qiongxian (3); Liu, Rumin (4)

Author affiliation: (1) Sinopec Exploration & Production Research Institute, Beijing; 100083, China; (2) Exploration and Development Research Institute, Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457001, China; (3) Exploration and Development Research Institute, Sinopec Southwest Oil & Gas Company, Chengdu; Sichuan; 610041, China; (4) China Oilfield Services Ltd. Cosl Production Optimization, Tianjin; 300459, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Studying the characteristics of reservoir fractures and clarifying the formation mechanisms of fractures are of great significance to defining reservoir types and properties, predicting fracture distribution, optimizing well location and figuring out the effect of fractures on gas reservoir development. In this paper, the 4th member of Leikoupo Fm, Middle Triassic in the Longmenshan piedmont of the Sichuan Basin was taken as an example. The genetic

types and development characteristics of natural fractures there were studied based on core, thin section, image logging and testing data. Then, combined with burial history and tectonic evolution history, the formation mechanisms of tectonic fractures and diagenetic fractures were analyzed after fracture mating by stages was studied. And the following research results were obtained. First, tectonic fracture and diagenetic fracture are two main genetic types that are developed in the carbonate reservoir of the 4th Member of Leikoupo Fm in the Longmenshan piedmont. Tectonic fractures include tension fracture and shearing fracture, and the latter is dominant. Diagenetic fractures include dissolution fracture, structural-dissolution fracture and stylolite. Second, dissolution fractures are formed by the denudation of different dissolved fluids in the penecontemporaneous stage, ancient supergene stage and burial stage, and the tectonic fractures are formed under the effect of the NW compressional stress field with the formation and continuous evolution of Longmenshan piedmont during the second episode of the late Indosinian period, the third episode of the late Indosinian period to the early and middle Yanshanian period, the middle-late Yanshanian period and the Himalayan period. It is concluded that tectonic fractures and diagenetic fractures of Leikoupo Fm in this area are intercalated, cut and limited mutually in main formation stages, resulting in complex fracture systems in reservoirs, which are favorable for the improvement of local reservoir physical properties and gas reservoir development results. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 26

Main heading: Fracture

Controlled terms: Carbonation - Dissolution - Landforms - Petroleum reservoirs - Reservoirs (water) - Tectonics

Uncontrolled terms: Carbonate rock - Formation mechanism - Longmenshan piedmont - Sichuan Basin - Tidal flat - Triassic

Classification code: 441.2 Reservoirs - 481.1 Geology - 512.1.1 Oil Fields - 802.2 Chemical Reactions - 802.3

Chemical Operations - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.11.002

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

53. Development dynamic monitoring technologies used in the Puguang high-sulfur gas field

Accession number: 20185106260096

Title of translation:

Authors: Zeng, Daqian (1); Peng, Xinling (2); Fu, Dekui (2); Hu, Jie (2); Wu, Xiaolei (2); Zhang, Junfa (1)

Author affiliation: (1) Sinopec Exploration & Production Research Institute, Beijing; 100083, China; (2) Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457001, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 63-69

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: There is lack of performance monitoring technologies and related standards and specifications in the Puguang Gas Field, which is ultra deep with high sulfur content. In this paper, five key technologies of dynamic monitoring were developed and the related standards and specifications were formulated by investigating high-sulfur gas fields at home and abroad, combined with equipment development, laboratory experiments, theoretical research and field tests. The five key technologies include gas production profile logging, downhole sampling and fluid phase analysis, dynamic water invasion prediction and water producing horizon identification, gas well productivity testing and evaluation, and development monitoring and safety control of high-sulfur ul tradeep wells. Then, these key technologies were applied for verification in th e Puguang Gas Field. And the following research results were obtained. First, the high-sulfur gas production profile logger has a temperature resistance of 175 and pressure resistance of 105 MPa. Forty three well times gas production profile logging is carried out with a success ratio of 100%. Second, the high-sulfur downhole pressure sampler has a temperature resistance of 150 and pressure resistance of 70 MPa. Seven well times downhole pressure sampling is carried out with a success ratio of 100%. Third, elemental sulfur is

precipitated in the formation when the formation pressure drops to 29.5 MPa. And no sulfur is deposited in the wellbore when the production rate of gas well is higher than 20×10^4 m³/d. Fourth, water producing horizons can be identified accurately and water breakthrough time of gas wells can be predicted by using water producing horizon identification technology and dynamic water invasion prediction model. Water influx rates can be controlled and water-free gas production period of gas wells can be extended by optimizing and adjusting the working systems of gas wells. And fifth, full coverage of gas well productivity testing is realized by using the testing technology of "downhole implanted gauge & cable delivery & wellhead variable flow rate", pressure calculation model and well testing interpretation model, and the productivity evaluation results of gas wells are accurate. Sixth, the dynamic gas tight pressure of the cable multi-stage leakage control system of super-high pressure and gas tightness is 50 MPa, and the processing technology for waste gas of blowout hookup is applied to 143 well times testing operation with zero leakage and zero pollution. In conclusion, these performance monitoring technologies have been playing an important role in scientifically formulating the production and reserves increase measures and ensuring long-term stable production of the Puguang Gas Field. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Oil field equipment

Controlled terms: Cables - Forecasting - Gas industry - Gases - Monitoring - Natural gas well production - Natural gas wells - Oil field development - Petroleum reservoir evaluation - Pollution control - Productivity - Proven reserves - Safety testing - Specifications - Temperature control - Well pressure - Well testing - Wellheads

Uncontrolled terms: Deliverability test - Development performance - Gas productions - High sulfur contents - Leakage prevention - Phase state - Puguang gas field - Ultra deeps - Water influx

Classification code: 511.2 Oil Field Equipment - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 731.3 Specific Variables Control - 902.2 Codes and Standards - 914.1 Accidents and Accident Prevention

Numerical data indexing: Percentage 1.00e+02%, Pressure 1.05e+08Pa, Pressure 2.95e+07Pa, Pressure 5.00e+07Pa, Pressure 7.00e+07Pa

DOI: 10.3787/j.issn.1000-0976.2018.10.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

54. Response analysis of long-distance buried pressure pipelines under seismic loads based on the stochastic space-time coupling

Accession number: 20191306691391

Title of translation:

Authors: Zhang, Peng (1); Wang, Yihuan (2); Qin, Guojin (2)

Author affiliation: (1) School of Civil Engineering and Architecture, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) School of Mechatronic Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 120-127

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Seismic research on long-distance buried pressure pipelines has become an important issue in current pipeline safety assessment. The seismic load is objectively a four-dimensional space-time excitation that changes with time and space. From a statistical point of view, it can be used as a time-varying stochastic process and a stochastic field with spatial variation. This paper proposes a concept of stochastic space-time for the time-varying characteristics of seismic loads and the time-delay effect of spatial variation. Considering the influence of site types, based on the stochastic deployment of the Clough-Penzien model of stochastic ground motion spectrum model and a kind of a semi-theory and semi-empirical model of stochastic field, a mathematical model of stochastic space-time seismic

loads suitable for practical engineering was established. According to the dynamic equation of uniform excitation, the response analysis of long-distance buried pressure pipelines under multi-point excitation was carried out, and the stress analysis was made based on the von-Mises's fourth strength theory. In a case study, such numerical simulation and analysis were carried out and the following findings were achieved. (1) As for long-distance pipelines, response from the non-uniform excitation has a greater impact than that from the uniform excitation. (2) The coupling response from the four-dimensional space-time excitation should be re-analyzed based upon seismic data after being modeled. (3) The response of pipelines under seismic loads is featured by random time and space. In conclusion, the time-varying characteristics of the loads and the motion correlation at any point of the ground motion site should be both considered in a reasonable analysis and design method, and the proposed model is of great significance to the design and research of long-distance pipelines under seismic loads. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 32

Main heading: Stochastic models

Controlled terms: Pipelines - Random processes - Seismic design - Seismology - Stochastic systems - Stress analysis - Water pipelines

Uncontrolled terms: Long distance pipelines - Seismic - Seismic excitations - Seismic load - Space-time coupling - Stochastic field - Time-space

Classification code: 408 Structural Design - 484.1 Earthquake Measurements and Analysis - 619.1 Pipe, Piping and Pipelines - 922.1 Probability Theory - 951 Materials Science - 961 Systems Science

DOI: 10.3787/j.issn.1000-0976.2018.12.015

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

55. Optimization of the LNG cold energy air separation process based on the advanced exergy analysis method

Accession number: 20185206284686

Title of translation: LNG

Authors: Ma, Guoguang (1); Li, Yaxian (1); Zhang, Chen (1)

Author affiliation: (1) School of Oil & Natural Gas Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

Corresponding author: Li, Yaxian(740520636@qq.com)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 121-128

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: By virtue of the traditional exergy analysis method, only the key equipments with exergy loss can be identified while the main causes of the loss cannot be found out. In this paper, an advanced exergy analysis method was proposed to solve the defect of the traditional one. Firstly, based on the basic data of the Dalian LNG receiving station, the proposed air separation process of LNG cold energy was simulated by using the software HYSYS. Then, the traditional exergy and the advanced one were calculated and analyzed. The distribution of various exergy loss in main equipments was analyzed and the main reasons for the exergy loss were figured out. Finally, the process was optimized on the basis of the advanced exergy analysis results. And the following research results were obtained. First, the exergy loss can be divided into four parts, i.e., avoidable endogenous loss, avoidable exogenous loss, unavoidable endogenous loss and unavoidable exogenous loss. Second, the distribution of exergy loss in different compressors is similar and the proportion of avoidable endogenous loss is higher. Third, the exergy loss of different heat exchanging devices is different. The avoidable exogenous exergy loss is dominant in the heat exchanging devices of LNG104, E100 and E101 while the unavoidable endogenous exergy loss is dominant in the other heat exchanging devices. Fourth, the proportion of avoidable exogenous exergy loss is higher in the water coolers of E100 and E101. Fifth, based on the advanced exergy analysis results, two optimization schemes are put forward in respect to replacing

compressor, increasing cold flow and increasing pre-cooling equipment. Compared with the original scheme, the energy consumption and exergy utilization ratio of unit liquid product in the two optimization schemes are better. Based on comparative analysis, Scheme 2 is selected, and its energy consumption is about 0.3949 kwh/kg (decreased by 6.6%) and its exergy utilization ratio is about 0.40 (increased by 28.891%). In conclusion, the optimization results prove the feasibility of applying the advanced exergy analysis method in the air separation process of LGN cold energy. The research results provide a new technological idea for the optimization of air separation process in actual engineering. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Exergy

Controlled terms: Energy utilization - Heat exchangers - Optimization - Separation

Uncontrolled terms: Air separation - Exergy Analysis - Exergy efficiencies - Exergy loss - LNG cold

Classification code: 525.3 Energy Utilization - 616.1 Heat Exchange Equipment and Components - 641.1

Thermodynamics - 802.3 Chemical Operations - 921.5 Optimization Techniques

Numerical data indexing: Percentage 2.89e+01%, Percentage 6.60e+00%

DOI: 10.3787/j.issn.1000-0976.2018.09.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

56. CBM accumulation characteristics and exploration target selection in northeastern Yunnan, China

Accession number: 20185206284673

Title of translation:

Authors: Shao, Longyi (1); Wang, Xuétian (1); Zhang, Jiaqiang (2); Hou, Haihai (1); Tang, Yue (2); Wang, Jumin (3); Lin, Yucheng (4)

Author affiliation: (1) College of Geoscience and Surveying Engineering, China University of Mining and Technology, Beijing; 100083, China; (2) Oil and Gas Resource Survey Center, China Geological Survey, Beijing; 100011, China; (3) Yunnan Provincial Coal Geological Survey Institute, Kunming; Yunnan; 650218, China; (4) Yunnan Provincial Bureau of Coal Geology, Kunming; Yunnan; 650034, China

Corresponding author: Wang, Xuétian(827828904@qq.com)

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: There are abundant coal resources and coalbed methane (CBM) resources in the Zhenxiong-Weixin Coalfield in the northeastern Yunnan Province and its CBM exploration and development prospect is promising. In order to promote the exploration and development of CBM resources in this area, we studied previous coalfield survey data and CBM geological exploration data. Then, we analyzed the relationships of gas content and methane concentration vs. coal seam thickness, burial depth, coal petrology, coal quality and roof and floor lithology from the aspects of gas bearing property, coal seam distribution, coal petrology, coal quality, and lithological assemblage of coal bearing strata. Besides, we briefly discussed the main influential factors of CBM accumulation. Finally, we established a CBM area selection evaluation model based on multi-layered fuzzy mathematics and applied it to CBM favorable zone evaluation in this study area. And the following research results were obtained. First, the main factors controlling CBM accumulation are coal seam thickness, burial depth and sealing capacity of roof and floor. Second, eleven third-order evaluation parameters are selected out from the aspects of resource potential, reservoir property, storage condition and development condition as CBM exploration target evaluation indicators. Third, the evaluation results of CBM area selection evaluation model show that the CBM exploration and development potential is the best in the Xin Zhuang Field, followed by Luowang, Niuchang-Yigu, and Mahe. These research results provide a geological basis for CBM exploration and development in northeastern Yunnan in the following step. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 27

Main heading: Coal deposits

Controlled terms: Coal - Coal bed methane - Digital storage - Firedamp - Floors - Gasoline - Lithology - Methane - Parameter estimation - Petroleum prospecting - Petroleum reservoir evaluation - Petrology - Pile foundations - Rocks - Roofs

Uncontrolled terms: Accumulation characteristics - Analytical Hierarchy Process - Evaluation - Late Permian - Northeastern Yunnan - parameter - Xinzhuang Field

Classification code: 402 Buildings and Towers - 481.1 Geology - 481.1.2 Petrology (Before 1993, use code 482) - 483.2 Foundations - 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 523 Liquid Fuels - 524 Solid Fuels - 722.1 Data Storage, Equipment and Techniques - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.09.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

57. Numerical simulation on the resistivity of hydrate-bearing sediment based on the fractal pore model

Accession number: 20191006600880

Title of translation:

Authors: Chen, Yufeng (1); Wu, Nengyou (2); Liang, Deqing (3); Hu, Ronghua (1)

Author affiliation: (1) School of Chemical Engineering and Resource Recycling, Wuzhou University, Wuzhou; Guangxi; 543002, China; (2) Key Laboratory of Gas Hydrate, Ministry of Natural Resources, Qingdao; Shandong; 266071, China; (3) Key Laboratory of Gas Hydrate, Chinese Academy of Sciences, Guangzhou; Guangdong; 510640, China

Corresponding author: Liang, Deqing(liangdq@ms.giec.ac.cn)

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Pages: 128-134

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Resistivity method is an important method to determine the saturation of natural gas hydrate (hereinafter "hydrate" for short), and numerical simulation is effective to research the resistivity characteristics of hydrate bearing sediments. The pore models established in the past cannot reflect the actual pore structure because there are fewer constraint conditions. Based on the self-similar characteristic of natural sediments, we selected the Sierpinski Carpet with its total side length of 3 and particle's side length of 1 as the fractal pore model of sediment, and according to the equivalent resistance network, we established an electrical conductivity model of hydrate bearing sediments. In this paper, the effects of porosity, interstitial water conductivity and sediment skeleton conductivity on the relationship between the resistivity of hydrate-bearing sediment and the hydrate saturation were analyzed using this model. And following research results were obtained. First, the resistivity of hydrate-bearing sediment can be expressed as the function of porosity, area ratio, microstructure size, interstitial water conductivity, sediment skeleton conductivity and empiric parameter. Second, sediment resistivity increases with the decrease of interstitial water conductivity and porosity. Third, the resistivity of hydrate-bearing sediment increases with the increase of hydrate saturation. Fourth, when the hydrate saturation is high, the resistivity of hydrate-bearing sediment decreases significantly with the increase of sediment skeleton conductivity. In conclusion, when the hydrate saturation is in a certain range, the calculation result of this fractal pore model is in line with the experimental data and logging data with a higher accuracy. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 30

Main heading: Gas hydrates

Controlled terms: Electric conductivity - Fractals - Hydration - Musculoskeletal system - Numerical methods - Numerical models - Pore structure - Porosity - Sediments

Uncontrolled terms: Calculation results - Constraint conditions - Electrical conductivity - Equivalent resistance - Fractal model - Hydrate bearing sediments - Hydrate saturation - Resistivity methods

Classification code: 461.3 Biomechanics, Bionics and Biomimetics - 483 Soil Mechanics and Foundations - 522 Gas Fuels - 701.1 Electricity: Basic Concepts and Phenomena - 921 Mathematics - 921.6 Numerical Methods - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.11.017

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

58. Orderliness of hydrocarbon distribution in the Longfengshan area of the Changling fault depression, Songliao Basin, and its main controlling factors

Accession number: 20183905863714

Authors: Fan, Jie (1); Jiang, Youlu (1); Liu, Jingdong (1); Zhu, Jianfeng (2); Li, Ruilei (2)

Author affiliation: (1) School of Geosciences, China University of Petroleum-Huadong, Qingdao; Shandong; 266580, China; (2) Sinopec Northeast Oil and Gas Company, Changchun; Jilin; 130062, China

Corresponding author: Jiang, Youlu(jiangyl@upc.edu.cn)

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The orderliness of hydrocarbon distribution in the Songliao Basin has been rarely studied and its main controlling factors have not defined yet, which impedes the oil and gas exploration in this area to certain extent. In this paper, the Longfengshan area in the Changling fault depression, a new exploration area in the Songliao Basin, was taken as an example to describe the orderliness of hydrocarbon distribution from the aspects of reservoir type, reserves abundance and hydrocarbon phase state. Then, based on hydrocarbon accumulation conditions, three hydrocarbon migration-accumulation units (S2, S203 and S201) were classified. Finally, the configuration of hydrocarbon accumulation elements was assessed quantitatively using the analytic hierarchy process, and the main factors controlling the hydrocarbon distribution regularity were defined. The following results were obtained. First, from the sag belt in the north to the structural belt in the west, the hydrocarbon phase state changes in an order of gas reservoir-oil and gas reservoir-oil reservoir, the reservoir type presents a gradual change of lithologic reservoir-structural-lithologic reservoir-lithologic-structural reservoir-structural reservoir, and the hydrocarbon reserves and abundance increase gradually. Second, the orderliness of hydrocarbon distribution in the study area is controlled by three factors. The orderliness of hydrocarbon phase state is controlled by the effectiveness of fault-source space-time configuration; that of reservoir type is controlled by the diversity of boundary conditions of hydrocarbon migration-accumulation units; and that of hydrocarbon enrichment degree is controlled by the diversity of fault-source-sandstone-caprock configuration. From the sag belt in the north to the structural belt in the west, the fault-source-sandstone-caprock configuration turns better and the hydrocarbon migration-accumulation capacity becomes stronger. In conclusion, S201 is the best in hydrocarbon accumulation conditions, source-fault-sandstone-caprock configuration and exploration potential, so it can be taken as a main target for future exploration. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Hydrocarbons

Controlled terms: Petroleum reservoir engineering - Petroleum reservoirs - Proven reserves - Sandstone

Uncontrolled terms: Changling fault depression - Hydrocarbon distribution - Hydrocarbon migration -

Longfengshan area - Main controlling factors - Oil sources - Orderliness - Songliao basin - Source rocks

Classification code: 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.05.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

59. Optimization of key parameters for horizontal well development of tight sandstone gas reservoirs

Accession number: 20183905876133

Authors: Fu, Suotang (1, 2); Fei, Shixiang (2, 3); Ye, Zhen (4); He, Lei (2, 3); Cui, Yuehua (2, 3)

Author affiliation: (1) PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (2) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China; (3) Exploration and Development Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (4) No. 4 Gas Production Plant, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710000, China

Corresponding author: Fei, Shixiang(fshix_cq@petrochina.com.cn)

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Publication year: 2018

Pages: 101-110

Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the Sulige Gas Field of the Ordos Basin, tight sandstone gas reservoirs are generally characterized by fast variation laterally and multi layers vertically, which brings challenges to horizontal well development. In this paper, some producing horizontal wells were finely evaluated in terms of their dynamic indicators such as well-controlled reserves, production decline rate and productivity. On this basis, the factors influencing the indexes of horizontal well development of tight sandstone gas reservoirs in a block of the Sulige Gas Field were analyzed from the aspects of deposition position, reservoir thickness, reservoir drilling length, hole section position, trajectory type and stimulation mode. Furthermore, the contribution of each parameter to horizontal well gas productivity was analyzed quantitatively by using the grey correlation method. The findings are as follows. First, the productivity of horizontal wells is affected most by the reservoir drilling length, followed by reservoir position, sedimentary microfacies, reservoir thickness, trajectory type and stimulation mode. Second, horizontal wells shall be designed according to the principles of deployment in the microfacies of point bar and middle channel, high-quality sand body with thickness over 8 m and in relatively stable lateral distribution, long horizontal section if possible economically, straight trajectory, and stimulation with open hole packer. These results have been successfully applied in the Sulige Gas Field. Especially, four deployment patterns are established, i. e., overall horizontal well development, stereoscopic horizontal well development, large-size cluster hybrid well development, and large-size cluster vertical & directional well development. The effective reservoir drilling ratio of drilled horizontal wells is more than 60%, the tested absolute open flow (AOF) of natural gas is higher than 40×10⁴ m³/d, and single-well production of horizontal wells is 4 times that of vertical wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Horizontal wells

Controlled terms: Gas industry - Gases - Infill drilling - Metamorphic rocks - Natural gas well production - Natural gas wells - Petroleum reservoirs - Productivity - Sandstone - Stereo image processing - Tight gas - Trajectories - Well stimulation

Uncontrolled terms: Ordos Basin - Parameter optimization - Reservoir thickness - Stimulation mode - Sulige gas field - Tight sandstone gas

Classification code: 482.2 Minerals - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 723.2 Data Processing and Image Processing

Numerical data indexing: Percentage 6.00e+01%, Size 8.00e+00m

DOI: 10.3787/j.issn.1000-0976.2018.04.012

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

60. Optimization of shale gas well pattern and spacing

Accession number: 20183905876136

Authors: Wei, Yunsheng (1); Wang, Junlei (1); Qi, Yadong (1); Jin, Yiqiu (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China

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: Shale gas is often developed under a factory-like mode with one well in one reservoir so that the layout of a development well pattern in one effort will be essential to the efficient development of a shale gas zone. Therefore, the determination of a proper well pattern and spacing is important for the enhancement of shale gas recovery rates. In view of this, the national shale demonstration Changning block was taken as an example to demonstrate the process of well pattern and spacing optimization. Based upon the single-well production performance analysis, "multi-well pad" numerical simulation was carried out to develop a method of pattern and spacing optimization realized by balancing four flow relationships, i. e., matrix contact area, inter-fracture interference, well interference and fracture-matrix inflow/outflow. First, through a comparative analysis on the interference tests and operation parameters, the well spacing was determined qualitatively. Then, an optimization model with the proppant volume as the constraint for dynamic parameters was established to develop a theoretical well-spacing analysis method, by which the optimal well spacing was determined after a quantitative evaluation, with a cluster as a basic unit, on the length, spacing, quantity, flow conductivity and penetration ratio of primary fractures. Finally, through a fine grid numerical simulation, the efficiency of the "W-shape" deployment of horizontal wells in two layers is primarily demonstrated on the development of the first member of the Longmaxi Fm shale gas reservoir. Natural fractures is the key factor for the well spacing optimization but in this case study of the Changning Block with undeveloped natural fractures, the "W-shape" deployment of horizontal wells in two layers was adopted with the 300 m well spacing as the main well pattern to enhance the shale gas recovery factor by more than 15% as a good result. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Natural gas wells

Controlled terms: Fracture - Gases - Horizontal wells - Numerical methods - Numerical models - Petroleum reservoir evaluation - Petroleum reservoirs - Recovery - Shale gas - Well spacing

Uncontrolled terms: Changning-Weiyuan National Shale Gas Demonstration Area - Natural fracture - Recovery factors - Sichuan Basin - Well interference - Well patterns

Classification code: 512 Petroleum and Related Deposits - 522 Gas Fuels - 921 Mathematics - 921.6 Numerical Methods - 951 Materials Science

Numerical data indexing: Percentage 1.50e+01%, Size 3.00e+02m

DOI: 10.3787/j.issn.1000-0976.2018.04.015

Compendex references: YES

Database: Compendex

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61. A determination method of potential condensate oil content of the samandeppe gas field, the right bank of the amu darya river of turkmenistan

Accession number: 20183905879910

Authors: Zhou, Keming (1); Liu, Henian (2); He, Jiahuan (1); Zhang, Peijun (3)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil and Gasfield Company, Chengdu; Sichuan; 610213, China; (2) PetroChina Overseas Exploration and Development Corporation, Beijing; 100034, China; (3) CNPC Turkmenistan Amu Darya Natural Gas Company, Beijing; 100101, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 6**Issue date:** June 25, 2018**Publication year:** 2018**Pages:** 59-66**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: The actual condensate oil production rate was far lower than that in the theoretical design index in the first few years' production of No. 1 Production Plant of the Samandepo Gas Field, the Right Bank of the Amu Darya River of Turkmenistan, for that the partner raised serious questions about our side and required a scientific and reasonable explanation. To accurately determine the potential content of condensate oil in this field and the condensate oil production rate in this plant, we established technical codes for fluid sampling and test methodologies for fluid analysis, based on which we analyzed and determined the compositions of well fluid and condensate oil content in this field, and then the relevant parameters and potential content of condensate oil were calculated and compared by the Russian method and our newly-established method. The following results were demonstrated. (1) In the newly-established method, the compositions of natural gas are required to include C10+ and N2, He, H2, O2+Ar, CO2, and H2S and the components of condensate oil required to exceed C30 +; (2) The condensate oil content of this field is calculated to be 77.27 g/m³ by the Russian method and 76.21 g/m³ by the new method, indicating that both methods have identical results; (3) Compared with the other old methods, this new method is of higher accuracy and the calculated results are more reliable. It is concluded that this new method can not only be used to determine the potential content of condensate oil in this field but solve the major technical issue perplexing Block A of the CNPC Turkmenistan Amu Darya Natural Gas Company. It also provides a robust technical support for the further production-expansion transformation of Block A and the nextstep development design for Block B, and the productivity construction of Project . © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 13**Main heading:** Well stimulation**Controlled terms:** Gas condensates - Gas industry - Gases - Hydrocarbons - Natural gas - Natural gas fields - Natural gasoline plants - Oil well testing - Public utilities - Rivers**Uncontrolled terms:** component - Condensate oil - Gas fields - High pressure - Single flash - Turkmenistan**Classification code:** 511.1 Oil Field Production Operations - 512.2.1 Natural Gas Fields - 513.2 Petroleum Refineries - 522 Gas Fuels - 804.1 Organic Compounds**Numerical data indexing:** Mass_Density 7.62e-02kg/m³, Mass_Density 7.73e-02kg/m³**DOI:** 10.3787/j.issn.1000-0976.2018.06.008**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

62. Mechanism of multi-stage sand filling stimulation in horizontal shale gas well development

Accession number: 20182905565471**Authors:** Li, Deqi (1); He, Feng (2); Ou, Weiyu (2); Zhu, Juhui (2); Li, Ran (1); Pan, Yong (2)**Author affiliation:** (1) PetroChina Zhejiang Oilfield Company, Hangzhou; Zhejiang; 310013, China; (2) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 1**Issue date:** January 25, 2018**Publication year:** 2018**Pages:** 56-66**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Fracturing operations in shale gas reservoirs of the Sichuan-Chongqing area are frequented by casing deformation, failures in delivery of mechanical staging tools and other down-hole complexities. In addition, limitation in volumes of tail-in proppant in the matrix area significantly restricts the conductivity in the near zones of the wellbore. Eventually, flowback performance and productivity of shale gas horizontal wells are negatively affected. With consideration to the limitations in the implementation of the mechanical staging technique with bridge plug for shale gas development in the Sichuan-Chongqing area, the technique of multi-stage sand filling stimulation in horizontal wells was proposed to solve the abovementioned problems. By filling sands in fractures, it is possible to divert fluids to maintain long-term high conductivity of fractures, which is the key to satisfactory EOR performances. By introducing the Hertz contact and fractal theory in the analysis of sand plug strength, and in combination of lab engineering simulation test results, the mechanical model for sand plugs in fractures with proppant was constructed. In terms of strength criteria and friction, the stability criteria of sandplug were put forward. Thus, the permeability fractural model for sand plugs in fractures was perfected. Test results show that the stability of sand slug in the earlier stage of production is mainly affected by fluid washing during flowback, so it is necessary to control the flowback rate strictly. In the later stage of production, the stability is mainly affected by fracture closure stress and flow pressure, so it is necessary to enhance the yield strength of proppant to maintain high conductivity of fractures. In conclusion, the multi-stage sand filling stimulation provides a new technique for multi-stage clustering fracturing operations in shale gas horizontal well development. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Horizontal wells

Controlled terms: Electric conductivity - Filling - Fracture - Gases - Petroleum reservoirs - Proppants - Sand - Shale - Shale gas - Stability criteria

Uncontrolled terms: Engineering simulation - Fracture closure stress - Fracturing operations - Multi-stage clustering - Reservoir stimulations - Sand filling - Shale gas reservoirs - Sichuan

Classification code: 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 522 Gas Fuels - 691.2 Materials Handling Methods - 701.1 Electricity: Basic Concepts and Phenomena - 951 Materials Science - 961 Systems Science

DOI: 10.3787/j.issn.1000-0976.2018.01.007

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

63. Space types and origins of hydrothermal dolomite reservoirs in the Middle Permian strata, Central Sichuan Basin

Accession number: 20182905565426

Authors: Jiang, Yuqiang (1, 2); Gu, Yifan (1, 2); Li, Kaihong (3); Li, Shun (4); Luo, Mingsheng (3); He, Bing (4)

Author affiliation: (1) School of Geoscience and Technology, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Sichuan Province Key Laboratory of Natural Gas Geology, Chengdu; Sichuan; 610500, China; (3) Shunan Division of Petro-China Southwest Oil and Gas Field Company, Luzhou; Sichuan; 646000, China; (4) Chuanzhong Division of PetroChina Southwest Oil and Gas Field Company, Suining; Sichuan; 629000, China

Source title: Natural Gas Industry

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Publication year: 2018

Pages: 16-24

Language: Chinese

ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Recently commercial gas flows have been obtained in several wells in the Middle Permian Qixia and Maokou strata in NW Sichuan Basin, where a great potential of natural gas exploration has been proven. However, opinions vary on the origins of the Permian dolomite reservoirs in this study area, no unanimous conclusion has ever been drawn. In view of this, based on core observation, microscopic thin section analysis, and the corresponding geochemical indexes in carbon, oxygen, strontium isotopes, and reservoirs inclusions homogenization temperature, an analysis was made on the hydrothermal dolomite reservoir types and facies characteristics, as well as such reservoir origins and their main controlling factors. The following findings were obtained. (1) The Middle Permian limestone

strata such as Maokou, Qixia, etc. have undergone structurally controlled hydrothermal activities and eventually hydrothermal dolomite reservoir facies were developed including typical hydrothermal mineral assemblages like saddle dolomite, fluorite and celestites, and hydrothermal breccia structures. (2) Compared to host limestones like micritic limestones, etc., medium-fine crystalline dolomites and saddle dolomites were displayed as $\delta^{18}\text{O}$ negative migration and $^{87}\text{Sr}/^{86}\text{Sr}$ positive migration. (3) The hydrothermal dolomite reservoir space is mainly composed of hydrothermal dissolved pores, hydrothermal intercrystalline pores, hydrothermal dissolved vugs, and hydrothermal enlarged fractures. In conclusion, it is demonstrated that the development and distribution of hydrothermal dolomite reservoir facies, controlled by large basement-rooted faults, are mainly distributed, from the seismic data, in a "lenticular form" in the area which is featured by "concave" seismic reflection; and that the organic combination of the Middle Permian hydrothermal dolomite reservoirs, underlying hydrocarbon source rocks and the overlying seal strata will be possibly a favorable exploration target in this study area. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 31

Main heading: Petroleum prospecting

Controlled terms: Crystalline materials - Exploratory geochemistry - Fluorspar - Isotopes - Lime - Limestone - Natural gas wells - Seismic waves - Seismology

Uncontrolled terms: Central - Dolomite reservoirs - Hydrothermal dolomite - Permian - Reserve-permeate space - Sichuan Basin - Strontium isotopes

Classification code: 481.2 Geochemistry - 482.2 Minerals - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 804.2 Inorganic Compounds - 933.1 Crystalline Solids

DOI: 10.3787/j.issn.1000-0976.2018.02.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

64. Progress, challenges and prospects of shale gas exploration in the Wufeng-Longmaxi reservoirs in the Sichuan Basin

Accession number: 20183905876129

Authors: Dong, Dazhong (1, 2, 3); Shi, Zhensheng (1, 2, 3); Guang, Quanzhong (4); Jiang, Shan (1); Zhang, Mengqi (5); Zhang, Chenchen (6); Wang, Shuyan (7); Sun, Shasha (1, 2, 3); Yu, Rongze (1, 2, 3); Liu, Dexun (1, 2, 3); Peng, Ping (8); Wang, Shiqian (8)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) National Energy Shale Gas R&D Center, Langfang; Hebei; 065007, China; (3) PetroChina Key Laboratory of Unconventional Oil & Gas Resources, Langfang; Hebei; 065007, China; (4) China University of Petroleum, Beijing, Beijing; 102200, China; (5) School of Earth and Space Science, Peking University, Beijing; 100871, China; (6) Sinopec Exploration & Production Research Institute, Beijing; 100083, China; (7) Exploration Division, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (8) Research Institute of Exploration and Development, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

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Publication year: 2018

Pages: 67-76

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Sichuan Basin is a major target for shale gas exploration in present China because of its rich gas stored in abundant black shales with multiple bed series. For further guidance or reference, field exploration and development practices in the Upper Ordovician Wufeng-Lower Silurian Longmaxi shale reservoirs were studied in terms of development stages and progress, favorable conditions for shale gas accumulation, bottlenecking issues on theories and technologies related to shale gas development, and so on. The following findings were obtained. (1) Shale with rich organic matters originated from the deep shelf has a good quality and great thickness in the continuous beds. The relatively stable wide buffer zones in synclines (anticlines) provides favorable conditions for shale gas accumulation and preservation with well-developed micro-fractures and overpressure as necessary factors for a great

potential of high shale gas productivity. (2) The bottlenecking technical issues restricting the shale gas industrial development in this study area include the following aspects: understandings of rich-organic matter shale sedimentary facies and modes, shale reservoir diagenetic process and evaluation systems, shale gas generation and accumulation mechanism, geophysical logging identification and prediction of shale gas layers, low resource utilization rate, great uncertainty of shale gas development, no technological breakthrough in the exploration of shale gas reservoirs buried deeper than 3 500 m. In conclusion, this study area will be the major target for the shale gas exploration and development in China in a rather long period in the future. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 34

Main heading: Petroleum prospecting

Controlled terms: Biogeochemistry - Biological materials - Gases - Geological surveys - Organic compounds - Petroleum reservoir evaluation - Petroleum reservoirs - Shale gas

Uncontrolled terms: Challenge - Progress - Prospect - Sichuan Basin - Silurian

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds

Numerical data indexing: Size 3.50e+03m

DOI: 10.3787/j.issn.1000-0976.2018.04.008

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

65. Injection-production mechanisms and key evaluation technologies for underground gas storages rebuilt from gas reservoirs

Accession number: 20183905876137

Authors: Sun, Junchang (1, 2); Xu, Hongcheng (1, 2); Wang, Jieming (1, 2); Shi, Lei (1, 2); Li, Chun (1, 2); Tang, Ligen (1, 2); Zhong, Rong (1, 2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) CNPC Key Laboratory of Oil & Gas Underground Gas Storage Engineering, Langfang; Hebei; 065007, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Pages: 138-144

Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 20

Main heading: Underground gas storage

Controlled terms: Dynamics - Geology - Petroleum reservoir evaluation - Petroleum reservoirs

Uncontrolled terms: Dynamic sealing - Evaluation index - Gas reservoir - Injector-producer flow - Operation law - Production mechanisms - Production modes - Storage capacity

Classification code: 481.1 Geology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels

Numerical data indexing: Percentage 7.50e+01%

DOI: 10.3787/j.issn.1000-0976.2018.04.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

66. CBM development in China: Challenges and solutions

Accession number: 20183905876132

Authors: Zhu, Qingzhong (1, 2); Yang, Yanhui (2, 3); Zuo, Yinqing (2, 3); Zhang, Xueying (2, 3); Zhang, Junjie (2, 3); Song, Yang (2, 3); Lang, Shumin (1, 2)

Author affiliation: (1) PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China; (2) The CBM Exploration and Development pilot Test Base of CNPC, Renqiu; Hebei; 062552, China; (3) Exploration and Development Research Institute, PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China

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Pages: 96-100

Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Low single-well yield has troubled the coalbed methane (CBM) industry in China for a long period. In this paper, the challenges in CBM development in the Qinshui Basin of PetroChina Huabei Oilfield Company were analyzed systematically, and then relevant solutions were proposed. According to this study, it is necessary to select the effective engineering technique based on the CBM production characteristics (i. e., desorption-diffusion-percolation) in the Qinshui Basin to ensure the increase of production. The pilot test of development technology in the CBM low-efficiency development areas has revealed a certain contribution to production enhancement, but it is still a long way to improve the overall CBM productivity of such areas. Currently, the target layer in the demonstration area for CBM high-efficiency development is 900-1 200 m deep. This project will be of great significance for efficiently recovering nearly 80% of CBM resources in medium and deep coal beds in China. Some technical strategies are proposed. For example, the purpose of exploration appraisal will turn to accurate selection of high-efficiency high-quality reserves; the overall productivity construction will change to the preferential development of high-efficiency zones; the engineering technology for transforming formations will convert to one for dredging formations. It is finally concluded that the only way for CBM development is to strengthen the problem consciousness, keep innovative thinking, set up the strategic thinking scientifically, and make proper top-level design for development, making high-efficiency productivity construction and development realized. Moreover, three key aspects should be addressed, i. e. selection of efficient blocks for productivity construction, selection of optimal engineering technologies, and reduction of operation cost. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Oil field development

Controlled terms: Coal bed methane - Coal deposits - Cost engineering - Efficiency - Engineering technology - Firedamp - Methane - Natural gas wells - Operating costs - Petroleum prospecting - Productivity - Solvents

Uncontrolled terms: Block selections - Capacity restoration - China - Development - Development benefit - Operation cost - Qinshui basin - Single well production

Classification code: 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 803 Chemical Agents and Basic Industrial Chemicals - 804.1 Organic Compounds - 911 Cost and Value Engineering; Industrial Economics - 913.1 Production Engineering

Numerical data indexing: Percentage 8.00e+01%, Size 9.00e+02m to 1.20e+03m

DOI: 10.3787/j.issn.1000-0976.2018.04.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

67. Improving the natural gas pricing mechanism for residential consumers in China

Accession number: 20182905565481

Authors: Liu, Yijun (1)

Author affiliation: (1) College of Business Administration, China University of Petroleum, Beijing; 102249, China

Corresponding author: Liu, Yijun(pulyj@sina.com)

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Language: Chinese

ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The natural gas industry chain of China has entered the stage of rapid development, along which the natural gas pricing mechanism has changed a lot and been gradually improving, but domestic residential gas consumption has been extremely sensitive to gas price. In view of this, in order to exploit the role of gas prices played in the resource allocation, this paper first analyzed the gas pricing mechanism for residential customers in China. (1)The gas pricing mechanism plays an important part of the marketization of gas prices, they have adapted to each other before June 2013, but completely disjointed after that, the orientation of the reform should promote the latter to adapt the former. (2)The marketization of natural gas prices of China still remains at the intermediate stage, and some measures for advanced stage have been planned. (3)Improving the residential gas pricing mechanism is a long-term task, which takes about 10 years. (4)The residential gas pricing is facing some prominent problems, such as the dual-track pricing system of non-residential and residential sectors, the inadaptation of ladder pricing system in residential sector to the gas price marketization; the long-time unadjustment of the up-stream gas prices resulting in the outburst of multiple conflicts. On this basis, the following proposals are put forward. (1)The residential gas pricing system and the natural gas price marketization reform should be designed as a whole, with the construction of price linkage mechanism being highly concerned. (2)Let the up-stream gas prices become more flexibly adjusted than ever before. (3)The favorable "window period" should be a good opportunity for the policymakers to resolve the historic issue of cross-subsidization in the residential gas pricing system. (4)The market participants who bear the peak-shaving cost should be adjusted and a better peak-shaving cost share mechanism should be built up. (5)Reform pilots of the residential gas pricing mechanism should be promoted. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 38

Main heading: Costs

Controlled terms: Commerce - Gas industry - Gases - Housing - Ladders - Natural gas - Reforming reactions

Uncontrolled terms: China - Forming mechanism - Gas consumption - Price - Price linkage

Classification code: 403.1 Urban Planning and Development - 405.1 Construction Equipment - 522 Gas Fuels - 802.2 Chemical Reactions - 911 Cost and Value Engineering; Industrial Economics

Numerical data indexing: Age 1.00e+01yr

DOI: 10.3787/j.issn.1000-0976.2018.01.017

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

68. A calculation model of critical liquid-carrying velocity of gas wells considering the influence of droplet shapes

Accession number: 20182905565472

Authors: Pan, Jie (1, 2); Wang, Wujie (1); Wei, Yaoqi (1); Chen, Junbin (1); Wang, Liangliang (3)

Author affiliation: (1) College of Petroleum Engineering, Post-doctoral Innovation Base, Xi'an Shiyou University, Xi'an; Shaanxi; 710065, China; (2) Post-doctoral Research Station of Oil and Gas Engineering, China University of Petroleum, Beijing; 102249, China; (3) No.4 Gas Production Plant, PetroChina Changqing Oilfield Company, Ordos; Inner Mongolia; 017300, China

Corresponding author: Chen, Junbin(chenjbxu@126.com)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 67-73

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ISSN: 10000976

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Document type: Journal article (JA)

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Abstract: To clarify the existence of liquid loading and optimize the production allocation in gas wells, we constructed a model for calculating the critical liquid-carrying velocity based on the equal relationship between the total surface free energy of droplets and the total turbulent kinetic energy of gas and considering the droplet size, droplet deformation and the influence of droplet deformation on surface free energy. Based on the ellipsoid hypothesis and by analyzing the influence of droplet deformation on the surface area and free energy of droplets, the equation for calculation of the maximum diameter of windward surface of droplets was developed. With consideration to the influence of droplet deformation on drags, the expression for the critical liquid-carrying velocity of ellipsoid droplets was clarified. With consideration to the influence of deformation and internal flow of droplets, the drag coefficient of the ellipsoid droplets was determined to be 20% higher than that of the Brauer Model for spheroid. A functional relationship between the deformation parameter K and the critical Weber number We_c was established based on the energy conservation law. In addition, the calculation results were reduced by 10%. During the course, the impacts of gas-well pressure and temperature on surface tension were taken into account. The proposed model was compared with the models developed by Turner, Li Min, Wang Yizhong, Wang Zhibin and Xiong Yu, and on-site verification was conducted in 44 gas wells. The results show that the proposed model provides the prediction results in best coincidence with the actual performance of gas wells. In conclusion, the proposed model can be used to predict liquid loading in gas wells effectively. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 33

Main heading: Loading

Controlled terms: Deformation - Drag - Drag coefficient - Drop breakup - Free energy - Gases - Kinetic energy - Kinetics - Liquids - Natural gas well production - Natural gas wells - Surface tension - Velocity

Uncontrolled terms: Critical weber numbers - Deformation parameter - Gas well - Liquid droplets - Liquid loading

Classification code: 512.2.1 Natural Gas Fields - 641.1 Thermodynamics - 691.2 Materials Handling Methods - 931 Classical Physics; Quantum Theory; Relativity - 931.2 Physical Properties of Gases, Liquids and Solids

Numerical data indexing: Percentage 1.00e+01%, Percentage 2.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.01.008

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

69. Practices and achievements of the Changning-Weiyuan shale gas national demonstration project construction

Accession number: 20182905565424

Authors: Xie, Jun (1)

Author affiliation: (1) PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China

Corresponding author: Xie, Jun(xiejun01@petrochina.com.cn)

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 13

Main heading: Petroleum prospecting

Controlled terms: Demonstrations - Flow of gases - Gases - Natural gas well production - Petroleum reservoirs - Productivity - Shale gas

Uncontrolled terms: Changning-Weiyuan - Exploration and development - Practices and achievements - Sichuan Basin - Silurian - South

Classification code: 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1.2 Gas Dynamics

Numerical data indexing: Size 3.50e+03m

DOI: 10.3787/j.issn.1000-0976.2018.02.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

70. Laws of multi-fracture coupling initiation during blasting induced hydraulic fracturing

Accession number: 20191006600871

Title of translation:

Authors: Wu, Feipeng (1); Xu, Ersi (1); Wei, Xuemei (1); Liu, Hengchao (1); Li, De (1); Ding, Qianshen (1)

Author affiliation: (1) School of Petroleum Engineering, China University of Petroleum, Qingdao; Shandong; 266580, China

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Publication year: 2018

Pages: 65-72

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For figuring out the stress interference of multiphase fracture combinations and its effect on the fracture initiation pressure of subsequent hydraulic fracturing, a calculation model for the coupled stress field with multiple induced fractures preexisted was established based on the calculation model for the stress field with single induced fracture preexisted, and the change laws of circumferential stress field around the wellbore under the effect of induced stress were analyzed. Then, the fracture initiation pressure of subsequent hydraulic fracturing was calculated according to the fracturing mechanics criterion. Finally, the effects of the length, phase, horizontal principal stress difference coefficient and quantity of preexisting fractures on its initiation pressure were analyzed. And the following research results were obtained. First, the circumferential stress difference in the area near the fractures behind the preexisting fractures increase greatly and even the horizontal principal stress is reversed. Second, as the length of new preexisting fractures increases, the initiation pressure of initial preexisting fractures rises first and then drops. And when the length of new preexisting fractures is equal to that of the initial preexisting fractures, the initiation pressure of initial preexisting fractures drops quickly first and then slowly. Third, the initiation pressure of high phase fractures is lower than that of low phase fractures. Fourth, with the increase of fracture quantity, the initiation pressure of new preexisting fractures drops gradually, but the decline trend of initiation pressure difference is not obvious. Fifth, the stress interference of multiphase fractures influences the fracture initiation pressure, and high-phase long fractures and low-phase short fractures are both favorable for the simultaneous initiation of multiphase fractures. Sixth, synchronous propagation of multiple fractures can generate more complicated stress interference and excite the evolution of hydraulic fracture network, so as to realize uniform fracturing stimulation. In conclusion, the research results can provide a theoretical guidance for the design of fracturing operation, e.g. perforation phase of blasting induced fracturing, scale of induced fractures, and pump pressure of subsequent hydraulic fracturing. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Fracture

Controlled terms: Blasting - Drops - Hydraulic fracturing - Stresses

Uncontrolled terms: Fracture network - Fracturing operations - Ground stress - Induced stress - Multi-fractures

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.11.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

71. Application of microseismic monitoring technology in underground gas storage

Accession number: 20185006230371

Title of translation:

Authors: Wei, Lulu (1); Jing, Gang (2); Xu, Gang (1); Wang, Fei (1); Li, Xiaofeng (1); Liu, Bo (1)

Author affiliation: (1) CNPC Bureau of Geophysical Prospecting INC., Zhuozhou; Hebei; 072750, China; (2) PetroChina West-East Gas Pipeline Company, Zhenjiang; Jiangsu; 212000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to ensure the integrity and safety of underground gas storage (UGS) during its building and running, it is necessary to establish a complete monitoring system. In this paper, the principles of main microseismic monitoring technologies (i.e., P-S wave location algorithm and b-value method) were firstly analyzed. Then, one salt cavern UGS in eastern China was taken as an example. Its solution mining and gas injection process was monitored using microseismic monitoring technologies, and the locations of microseismic events were inverted by means of P-S wave location algorithm. Furthermore, the morphology of the cavity was depicted according to the location results of microseismic events near the cavity-building well. In addition, the microseismic events were analyzed using b-value method to determine whether a faulting activity is induced in gas injection, so as to provide reference for the safe operation of UGS. And the following research results were obtained. First, no large fracture or collapse was discovered in the cavity-building well of this salt cavern UGS. And it is indicated that the solution mining process is safe. Second, the shape of the cavity is irregular and it can be approximated as a cylinder. Third, the increase of gas injection pressure of gas injecting well can induce a faulting activity, but whether the induced faulting activity has damage to the UGS integrity cannot be judged unless long-term monitoring and analysis are carried out in this area. In conclusion, the upper limit pressure of the gas injecting wells near the fault shall be reduced in order to ensure the safe operation of UGS. In addition, microseismic monitoring technology plays a vital role in guaranteeing the safe operation of UGS, so it is necessary to strengthen the real-time UGS monitoring during its building and running so as to provide a scientific basis for its early safety warning and operation optimization. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Microseismic monitoring

Controlled terms: Caves - Faulting - Gas injection (Enhanced recovery) - Injection (oil wells) - Location - Monitoring - Morphology - Salt deposits - Seismology - Shear waves - Solution mining - Underground gas storage

Uncontrolled terms: B value - Gas injection process - Injection pressures - Long term monitoring - Microseismic monitoring technology - Operation optimization - S-waves - Salt caverns

Classification code: 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 502.1 Mine and Quarry Operations - 505.1 Nonmetallic Mines - 511.1 Oil Field Production Operations - 522 Gas Fuels - 931.1 Mechanics - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.08.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

72. Sand fracturing technologies for deep and ultra-deep fractured tight sandstone gas reservoirs: A case study of Dabei and Keshen gas reservoirs in the Tarim Basin

Accession number: 20185006230374

Title of translation: --,

Authors: Che, Mingguang (1, 2); Wang, Yonghui (1, 2); Peng, Jianxin (3); Yang, Xiangtong (3); Zou, Guoqing (3); Wang, Liao (1, 2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) PetroChina Key Laboratory of Oil & Gas Reservoir Stimulation, Langfang; Hebei; 065007, China; (3) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 63-68

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The technical bottlenecks for the fracturing stimulation of deep and ultra-deep fractured tight sandstone gas reservoirs lie in the properties of high-temperature weighted fracturing fluid and the separated layer stimulation technologies. In this paper, Dabei and Keshen Gas reservoirs in the Tarim Basin were taken as examples. After prefrac evaluation was carried out from the aspects of natural fractures opening conditions, vertical in-situ stress and temporary plugging and diverting of fractured sandstone, high-temperature weighted fracturing was prepared and the conventional sand fracturing technology for deep and ultra deep wells and the temporary plugging and diversion fracturing technology to increase the vertical producing degree of reservoirs in long hole sections were developed and tested on site. And the following research results were obtained. First, during the activation of natural fractures, it is necessary to increase the net pressure and take the measures of small-size proppant filtration reduction or temporary plugging to stimulate natural fractures and keep their flow conductivity. Second, during the creation of main fractures, it is necessary to control the net pressure by adjusting the pumping rate and adopt the continuous sand mode of gel fracturing to make the natural fractures communicate. Third, inorganic salt KCl and NaNO₃ are selected to weight the fracturing fluid. And the maximum density of NaNO₃ weighted fluid is 1.35 g/cm³ and its highest temperature is 180. Fourth, the conventional sand fracturing technology is applied in the reservoirs with a few or undeveloped natural fractures. Its fracturing string is mainly the 88.9 mm tubing and KCl or NaNO₃ weighted fracturing fluid is adopted. And the gas production rate after fracturing is 2 to 5 times higher than that before fracturing. Fifth, the temporary plugging and diversion fracturing technology is applied in the long hole sections where the natural fractures are developed. Its fracturing string is mainly the 114.3 mm tubing and NaNO₃ weighted fracturing fluid is adopted. And the gas production rate after fracturing is 1 to 3 times higher than that before fracturing. In conclusion, this series of sand fracturing technologies provide a technical support for the efficient development of deep and ultra-deep fractured tight sandstone gas reservoirs in the Tarim Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Potassium compounds

Controlled terms: Chlorine compounds - Fracturing fluids - Gases - Hydraulic fracturing - Natural gas wells - Petroleum reservoir evaluation - Petroleum reservoirs - Sand - Sandstone - Sodium nitrate - Tight gas - Tubing

Uncontrolled terms: Deep wells - High pressure and high temperature - Natural fracture - Sand fracturing - Tarim Basin - Tight sandstone gas

Classification code: 482.2 Minerals - 483.1 Soils and Soil Mechanics - 512 Petroleum and Related Deposits - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines

Numerical data indexing: Mass_Density 1.35e+03kg/m³, Size 1.14e-01m, Size 8.89e-02m

DOI: 10.3787/j.issn.1000-0976.2018.08.009

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

73. Application of fuzzy-ball drilling fluid technology to CBM gas wells through the strata with lost circulation in the upper parts and collapse in the lower parts

Accession number: 20185206284683

Title of translation:

Authors: Wei, Panfeng (1); Zang, Yong (2); Chen, Xianjun (3); Yu, Xiaoming (4); Zhang, Jinwen (5); Yang, Mingzheng (6); Fan, Jingjing (7)

Author affiliation: (1) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing; 102249, China; (2) No.4 Drilling Engineering Company, CNPC Bohai Drilling Engineering Co., Ltd., Renqiu; Hebei; 062550, China; (3) Zhanjiang Branch of China France Bohai Geoservices Co., Ltd., Tianjin; 300452, China; (4) Changqing Oilfield Gas Storage Management Office, Jingbian; Shaanxi; 718500, China; (5) Technology Supervision and Inspection Department of PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China; (6) Louisiana State University, LA; U70808, United States; (7) Beijing Lihui Lab Energy Technology Co., Ltd., Beijing; 102200, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: September 25, 2018

Publication year: 2018

Pages: 95-102

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Complicated formations with lost circulation in the upper parts and collapse in the lower parts are often encountered during the drilling of coalbed methane (CBM) gas wells. And lost circulation and collapse are controlled generally by changing or adjusting drilling fluids, but with little effect due to the two different mechanisms. In this paper, laboratory tests were carried out to optimize the property range of different drilling fluids and instruct the formulas in order to satisfy the primary demand of different intervals, e.g. lost circulation and collapse control. Five formulas of fuzzy-ball drilling fluids, the plugging property of which is from weak to strong, were prepared to plug the fractures of 0.1 mm, 1.0 mm and 2.0 mm wide. Several technologies were developed specifically, e.g. on-site new fluid preparation and old fluid maintenance. The fuzzy-ball drilling fluid technology has been applied on site in many areas for more than 5 well times. And the following results were obtained on the basis of experimental evaluation. First, the pressure rising cycle from plugging the fracture of the same width to pressure rising to 20 MPa is used to characterize the plugging capacity of the fuzzy-ball drilling fluid system. Three drilling fluid formulas are selected and optimized, including lost circulation control while drilling, fracture plugging while drilling and fracture plugging while rig down. Second, the increasing amplitude of uniaxial tensile strength and triaxial compressive strength of the saturated core plunger is used to evaluate the anti-sloughing capacity. The drilling fluid formulas suitable for coal seams with collapse risk being low, medium and high are optimized respectively. Third, the supplying rate of this new fluid is optimized according to the consumption rate of drilling fluids. The dosage of the agent required to optimize the old fluid maintenance technique is determined according to the on-site pump rate, the decline amplitude of the apparent viscosity, and the experimentally measured apparent viscosity increase. Fourth, field application results show that the key to the success is to adjust the properties of drilling fluids well just before they are used in strata with lost circulation and collapse. In conclusion, lost circulation control and collapse prevention can be achieved by alternating the formulas of fuzzy-ball drilling fluid. This technology provides a technical support for realizing wellbore stability in coal beds and other similar friable formations. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29

Main heading: Drilling fluids

Controlled terms: Boreholes - Coal bed methane - Coal deposits - Compressive strength - Firedamp - Fracture - Infill drilling - Methane - Natural gas wells - Oil field equipment - Tensile strength - Viscosity

Uncontrolled terms: Collapse - Construction technologies - Fuzzy balls - Lost circulation - Plugging - Wellbore stability

Classification code: 503 Mines and Mining, Coal - 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 - 804.1 Organic Compounds - 951 Materials Science

Numerical data indexing: Pressure 2.00e+07Pa, Size 1.00e-03m, Size 1.00e-04m, Size 2.00e-03m

DOI: 10.3787/j.issn.1000-0976.2018.09.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

74. Migration characteristics of solid-phase particles in horizontal pipes in the exploitation of marine gas hydrate reservoirs through solid fluidization

Accession number: 20185106260101

Title of translation:

Authors: Li, Shutao (1); Wei, Na (1); Li, Haitao (1); Pang, Weixin (2); Xi, Yongzhao (1); Zhen, Lijun (2); Fu, Qiang (1, 2)

Author affiliation: (1) Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) CNOOC Research Institute Co., Ltd., Beijing; 100027, China

Corresponding author: Wei, Na(weina8081@163.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38**Issue:** 10**Issue date:** October 25, 2018**Publication year:** 2018**Pages:** 100-106**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: This paper aims to find out the migration law of solid phase particles in horizontal pipe sections in the exploitation of natural gas hydrate resources through solid fluidization. First, based on the liquid-solid two-phase flow model, the Fluent software was applied to couple with the EDEM software to simulate the migration of solid hydrate particles transported through horizontal pipe segments with different liquid phase velocities, various particle sizes and hydrate abundances. Then a large physical experimental simulator for solid fluidization exploitation was adopted to validate the results of numerical simulation. The following findings were obtained. (1) The main migration modes of single-particle hydrate in horizontal section are saltation and creep. And the migration pattern of hydrate particle clusters in horizontal pipe section was greatly affected by hydrate abundance, liquid phase velocity, pipe diameter and solid particle size; (2) When the hydrate abundance and the liquid phase velocity are higher and the pipe diameter is small, the migration modes of solid particles are dominated by saltation and creep movement; conversely, the migration mode is mainly suspension movement. (3) To increase the inlet liquid velocity is an efficient means to improve the purification effect in horizontal tube sections. It is concluded that choosing the secondary crushing device with better crushing effect can improve the purification effect of solid particle clusters in horizontal pipe section. Besides, the pressure drop in the horizontal pipe section is mainly affected by the liquid velocity. In the prerequisite of meeting the lifting pump equipment load, the liquid velocity should be adjusted to achieve the appropriate liquid phase flow rate. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15**Main heading:** Suspensions (fluids)**Controlled terms:** Creep - Crushing - Fluidization - Gas hydrates - Hydration - Liquids - Natural gas - Natural gas deposits - Particle size - Phase velocity - Piping systems - Purification - Two phase flow - Velocity**Uncontrolled terms:** Abundance - Horizontal pipes - Migration law - Pipe diameter - Solid particles**Classification code:** 512.2 Natural Gas Deposits - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 631.1 Fluid Flow, General - 711.1 Electromagnetic Waves in Different Media - 802.3 Chemical Operations - 804 Chemical Products Generally - 951 Materials Science**DOI:** 10.3787/j.issn.1000-0976.2018.10.014**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

75. Influence of reservoir primary water on shale gas occurrence and flow capacity

Accession number: 20184706088032**Title of translation:****Authors:** Hu, Zhiming (1); Duan, Xianggang (1); He, Yabin (2); Wu, Jianfa (3); Chang, Jin (1); Liu, Li (1); Wu, Kang (1, 4); Ma, Zhenyong (5)**Author affiliation:** (1) PetroChina Research Institute of Petroleum Exploration and Development, Langfang; Hebei; 065007, China; (2) Chuazhong Division, PetroChina Southwest Oil & Gasfield Company, Suining; Sichuan; 629000, China; (3) Shale Gas Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (4) Institute of Porous Flow & Fluid Mechanics, University of Chinese Academy of Sciences, Langfang; Hebei; 065007, China; (5) No.1 Oil Production Plant, PetroChina Qinghai Oilfield Company, Haixi; Qinghai; 816499, China**Corresponding author:** Duan, Xianggang(duanxg69@petrochina.com.cn)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 44-51**Language:** Chinese**ISSN:** 10000976

CODEN: TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: In this paper, shale samples of Lower Silurian Longmaxi Fm, taken from the Changning-Weiyuan area in the Sichuan Basin, were selected to figure out the influence of reservoir primary water on the adsorption laws and the flow capacity of shale gas. Experimental samples with different water saturations were prepared using the adsorption equilibrium method. Then, high-pressure isothermal adsorption experiments were carried out, and the isothermal adsorption effects and mechanisms of shale under different water saturations were discussed. Finally, the flow capacity of shale gas under different water saturations was tested using the independently developed steady-state flow test device. And the following research results were obtained. First, the presence of primary water in micronanometer pores of shale reservoirs reduces the adsorption capacity of shale. When the water saturation is 40%, the simulated total gas content is 18% lower than that in the conventional calculation result. Second, the apparent shale permeability is a function of pressure. Due to the effect of Knudsen diffusion, the apparent shale permeability increases significantly with the decrease of pressure under low pressure. When the average pressure is 5 MPa and the water saturation reaches 50%, the apparent shale permeability is about 70% lower than that of a dry sample. Third, when the water saturation is lower than the critical value, water is mainly presented as non-movable water in micropores and mesopores, and it has less effect on the flow capacity of shale gas. When the water saturation is greater than the critical value, the lodging point of water is changed, resulting in significant reduction of the shale gas flow capacity. It is concluded that an accurate understanding of the original water saturation and critical water saturation of shale reservoirs helps to calculate shale gas reserves accurately and predict gas well production rate rationally. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29**Main heading:** Proven reserves**Controlled terms:** Adsorption - Flow of gases - Gases - High pressure effects - Isotherms - Natural gas well production - Reservoirs (water) - Shale gas**Uncontrolled terms:** Flow capacity - Gas productions - Isothermal adsorption - Reserves - State of occurrence - Water saturations**Classification code:** 441.2 Reservoirs - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631.1.2 Gas Dynamics - 802.3 Chemical Operations**Numerical data indexing:** Percentage 1.80e+01%, Percentage 4.00e+01%, Percentage 5.00e+01%, Percentage 7.00e+01%, Pressure 5.00e+06Pa**DOI:** 10.3787/j.issn.1000-0976.2018.07.006**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

76. Causes of sand production and its influence on the output of fractured tight sandstone gas reservoirs: A case study on the Keshen Gas Field, Tarim Basin

Accession number: 20191006600869**Title of translation:** -**Authors:** Sun, Hedong (1); Chang, Baohua (1); Zhang, Jingnan (2); Zhang, Jianye (3); Wang, Xiaopei (3); Chen, Baoxin (3); Liu, Lei (3)**Author affiliation:** (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) CNPC Key Laboratory of Oil & Gas Storage and Transportation, PetroChina Pipeline R&D Center, Langfang; Hebei; 065000, China; (3) PetroChina Tarim Oilfield Company, Kurlu; Xinjiang; 841000, China**Corresponding author:** Chang, Baohua(changbaohua@petrochina.com.cn)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 11**Issue date:** November 25, 2018**Publication year:** 2018**Pages:** 52-58**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: The gas wells in the Keshen Gas Field, Tarim Basin, suffer from severe sand production. In view of this, the causes of sand production were analyzed in this paper from four aspects, i.e., reservoir stimulation, falling condition of rock particle on the wall of fracture, gas production and wellbore integrity. Then, based on the force analysis of the sand in the borehole, the formula for calculating the critical sand carrying production rate was established, and the influence of sand production on gas production was investigated. Finally, the countermeasures corresponding to different sand production stages of gas well were put forward. And the following research results were obtained. First, the causes of sand production in fractured tight sandstone gas reservoirs are developed reservoir fracture, high gas production rate, large-scale reservoir stimulation and poor wellbore integrity, among which the former two are the main causes. Second, if there is no free sand, the sand on the fracture wall near the well falls gradually when the gas production rate of the gas well is higher than 21.2×10^4 m³/d. Third, if there is free sand, the sand on the fracture wall near the well falls gradually when the gas production rate of the gas well is higher than 9.4×10^4 m³/d. Fourth, sand accumulation at wellhead and bottom hole is an important factor affecting the gas production rate of gas wells. In the early stages of sand production, sand accumulation at the wellhead is the main cause of gas production decline. In the middle and late stage of sand production, sand accumulation at the bottom hole is the main factor of gas production decline. Fifth, in the Keshen Gas Field, the critical production rate of sand production is lower and the critical sand carrying production rate is higher, so the key to treat the sand production of fractured tight sandstone gas reservoirs is to discharge sand in time so as to avoid large-scale sand accumulation in the borehole. In conclusion, these research results can be used as a reference for the treatment of sand production in fractured tight sandstone gas reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Natural gas well production

Controlled terms: Boreholes - Fracture - Gas industry - Gases - Natural gas wells - Oil field equipment - Petroleum reservoirs - Sand - Sandstone - Tight gas - Wellheads

Uncontrolled terms: Countermeasure - Fractured - Gas fields - Node analysis - Production rates - Sand production - Tarim Basin - Tight sandstone gas

Classification code: 482.2 Minerals - 483.1 Soils and Soil Mechanics - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.11.006

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

77. New understandings of the sedimentation mode of Lower Cambrian Longwangmiao Fm reservoirs in the Sichuan Basin

Accession number: 20184706088028

Title of translation:

Authors: Yang, Wei (1); Wei, Guoqi (1); Xie, Wuren (1); Liu, Mancang (1); Jin, Hui (1); Zeng, Fuying (1); Su, Nan (1); Sun, Ai (1); Shen, Yuhong (1); Ma, Shiyu (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Langfang; Hebei; 065007, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Natural gas in the gas reservoirs of Longwangmiao Fm, Lower Cambrian in the Sichuan Basin, is mainly concentrated in grain shoals, so the study on lithofacies palaeogeography and the prediction on grain shoal distribution are the key to improving the success ratio of natural gas exploration in this area. In this paper, outcrop, drilling, seismic and logging data were studied comprehensively. Then, based on previous research results, the sedimentary facies and sedimentary system mode of Longwangmiao Fm in the Sichuan basin and its adjacent areas were researched, and lithofacies paleogeographic maps were prepared. Besides, "three-shoal" sedimentary model of Longwangmiao

Fm was established, the distribution range of 3 shoal belts was predicted and their development characteristics and main control factors were analyzed. Finally, the following directions and fields of natural gas exploration were put forward. And the following research results were obtained. First, the paleogeographic pattern of the Sichuan Basin in the Longwangmiao period is a carbonate rimmed platform, and the sedimentary facies of mixed tidal flat, restricted platform, open platform, platform margin and slope are developed. Second, the "three-shoal" sedimentary model of Longwangmiao Fm is established. One of them is the platform-margin grain shoal, and it is distributed along the eastern margin of the Sichuan Basin. The other two are intra-platform grain shoals, and they are distributed on the east and west sides of the lagoon subfacies, belonging to the restricted platform facies and the open platform facies, respectively. Third, the grain shoal of restricted platform facies is the main reservoir of Longwangmiao Fm gas reservoir in the Anyue Gas Field. It is distributed in central Sichuan, and its development is controlled by lagoons and Gaoshiti-Moxi paleouplift. Fourth, the platform-margin grain shoal is mainly distributed along the northern and eastern margins of the basin, and its development is controlled by the slope break of sedimentary paleogeomorphy. In conclusion, the grain shoal of restricted platform facies and the shoal of platform margin facies are good reservoirs and they are the important fields of natural gas exploration. Furthermore, the new understanding of "three-shoal" sedimentary model and grain shoal distribution of Longwangmiao Fm is of great theoretical significance to the study on the sedimentary systems of ancient strata. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Natural gas fields

Controlled terms: Gas industry - Gases - Geological surveys - Natural gas - Petroleum prospecting - Petroleum reservoirs - Sedimentology

Uncontrolled terms: Early cambrians - Lithofacies palaeogeography - Natural gas exploration - Platform margins - Restricted platform - Sedimentary facies - Sichuan Basin

Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 522 Gas Fuels

DOI: 10.3787/j.issn.1000-0976.2018.07.002

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

78. Damage mechanism of cement slurry to CBM reservoirs with developed fractures and cleats: A case study from eastern Yunnan and western Guizhou in China

Accession number: 20185206284681

Title of translation:

Authors: Sun, Hansen (1); Wang, Chengwen (2)

Author affiliation: (1) China United Coalbed Methane Co., Ltd., Beijing; 100016, China; (2) College of Petroleum Engineering, China University of Petroleum (East China), Qingdao; Shandong; 266580, China

Corresponding author: Wang, Chengwen(wangcw@upc.edu.cn)

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Pages: 82-87

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The coalbed methane (CBM) reservoirs in the areas of eastern Yunnan and western Guizhou are characterized by developed cleats and fractures and low fracturing pressures, so cementing slurry ("slurry" for short) can invade into CBM reservoir easily, resulting in reservoir damage and abnormal increase of reservoir transformation fracturing pressure. In order to reveal the damage mechanisms of slurry to this type of coal reservoirs, we analyzed the physical and chemical properties and potential damage modes of coal rocks. Then, the development situations of fractures and pores before and after the coal core samples were internally contaminated and the invasion and plugging situations of slurry in fractures and pores were analyzed intuitively by means of CT scanning and scanning electron microscope (SEM), and the percentage of slurry and fractures in coal core volume was calculated. In this way, a method to quantitatively evaluate the damage of slurry to coal reservoirs was established. And the following research results were obtained. First, under the effect of differential pressure, slurry and its filtrate invade into coal

reservoirs along the fractures. The invasion degree varies with the development degree of fractures and pores. The more developed the fractures and pores, the higher the invasion degree. Second, the cement products formed after the slurry in the reservoirs gets cemented and solidified fill the fractures and pores tightly and cover the surface of coal core samples densely, so CBM flowing channels are blocked severely. Consequently, the permeability of coal core samples decreases and the compressive strength of coal rocks increase, leading to the abnormal increase of subsequent fracturing pressure and impacting the fracturing stimulation effects. Third, the effect of slurry filtrate on the alkali sensitivity and speed sensitivity of coal rocks is much less than the damage degree of slurry invasion to coal rocks. In conclusion, this newly developed quantitative evaluation method for the damage of slurry to coal reservoirs is of guiding significance to improving the cement job quality of coal reservoirs and ensuring the efficient CBM development. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Fracture

Controlled terms: Cementing (shafts) - Cements - Chemical analysis - Coal - Coal bed methane - Coal deposits - Compressive strength - Computerized tomography - Core samples - Firedamp - Mechanical permeability - Methane - Petroleum reservoir evaluation - Quality control - Reservoirs (water) - Rocks - Scanning electron microscopy

Uncontrolled terms: Cementing slurries - Damage evaluation - Damage mechanism - Development situations - Differential pressures - Physical and chemical properties - Quantitative evaluation methods - Western Guizhou

Classification code: 412.1 Cement - 441.2 Reservoirs - 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 524 Solid Fuels - 723.5 Computer Applications - 804.1 Organic Compounds - 913.3 Quality Assurance and Control - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.09.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

79. Stress corrosion cracking behavior of X90 pipeline steel and its weld joint at different applied potentials in near-neutral solutions

Accession number: 20185006230379

Title of translation: X90

Authors: Luo, Jinheng (1, 2); Luo, Sheji (3); Li, Lifeng (1, 2); Zhang, Liang (1, 2); Wu, Gang (1, 2); Zhu, Lixia (1, 2)

Author affiliation: (1) CNPC Tubular Goods Research Institute, Xi'an; Shaanxi; 710077, China; (2) State Key Laboratory of Performance and Structural Safety for Petroleum Tubular Goods and Equipment Material, Xi'an; Shaanxi; 710077, China; (3) Xi'an Shiyou University, Xi'an; Shaanxi; 710065, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: X90 pipeline steel is a new generation of pipeline steel developed after X80 and X100 pipeline steels, and it is now a new research hotspot at home. In order to thoroughly study the effect of applied potential on the soil stress corrosion cracking (SCC) behavior of X90 pipeline steel, we investigated the SCC behaviors of base metal and weld joint samples in the straight-weld pipe of X90 pipeline steel at different applied potentials in near-neutral solution using electrochemical measurements methods and slow strain rate testing (SSRT). Besides, the fracture surfaces were observed through scanning electron microscopy (SEM) and the mechanisms of the corrosion cracking behaviors were analyzed. And the following research results were obtained. First, the polarization curves of the base metal and weld joint samples in NS4 solution present the typical characteristics of anodic dissolution but no activation-passivation phenomenon happens. Second, In NS4 solution, the base metal and weld joint samples present SCC sensitivity. The SCC sensitivity indicator which is expressed by yield loss percentage elongation and yield loss percentage elongation area decreases firstly and then increases with the negative increase of the applied potential, and the SCC sensitivity of weld joint is higher than that of base metal. Third, there are three mechanisms on the SCC behaviors of base metal

and weld joint samples, i.e., anodic dissolution mechanism when the applied potential is open circuit potential (EOCP), anodic dissolution and hydrogen embrittlement mechanism when the applied potential is -850 mV, and hydrogen embrittlement mechanism when the applied potential is -1000 mV and -1200 mV. It is concluded that the research results can provide a technical support and theoretical basis for the large-scale application of X90 pipeline steel. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Stress corrosion cracking

Controlled terms: Cracks - Dissolution - Hydrogen - Hydrogen embrittlement - Metals - Pipeline corrosion - Pipelines - Residual stresses - Scanning electron microscopy - Soil testing - Solution mining - Steel corrosion - Steel pipe - Steel research - Strain rate - Underground corrosion - Welds

Uncontrolled terms: Anodic dissolution - Applied potentials - Base metals - Pipeline steel - Soil stress - Weld joints - Weld pipe

Classification code: 483.1 Soils and Soil Mechanics - 502.1 Mine and Quarry Operations - 531.1 Metallurgy - 538.2 Welding - 539.1 Metals Corrosion - 545.3 Steel - 619.1 Pipe, Piping and Pipelines - 802.3 Chemical Operations - 804 Chemical Products Generally

Numerical data indexing: Voltage -1.00e+00V, Voltage -1.20e+00V, Voltage -8.50e-01V

DOI: 10.3787/j.issn.1000-0976.2018.08.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

80. A new type of casing plugs effectively preventing the backflow of cement slurry

Accession number: 20191006600873

Title of translation:

Authors: Liu, Yunlou (1); Tang, Xin (1); Zhou, Zheng (1); Li, Bin (1); Zhang, Yichao (1)

Author affiliation: (1) Downhole Operation Company, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 11

Issue date: November 25, 2018

Publication year: 2018

Pages: 79-82

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For mitigating the hazards of slurry flowing back into the casing after liner cementing, the deficiency of slurry backflow prevention structure of current liner hangers at home and abroad was analyzed in this paper. Then, a structurally new casing plug, i.e., a semi-hollow casing plug was designed and developed. And it, combined with the hanger, was tested on site. And the following research results were obtained. First, the deficiency of the slurry backflow prevention structure of liner hanger, is that the locking mechanism on the drill pipe plug is damaged before it reaches the casing plug and matches with each other. Second, the inner bore of the semi-hollow casing plug is designed as a bend hole, which has a hollow round hole in its upper part and a solid column in its lower part. Third, during the cementing operation, the drill pipe plug enters into the semi-hollow casing plug once it gets to the position of hanger. And it is stuck at the bend and cannot go down anymore. Consequently it is integrated with the casing plug as a whole part. Fourth, when the shear pin goes down to the setting seat through the casing string under the force of drilling fluid, the solid column at the lower part of the semi-hollow casing plug is squeezed into the inner hole of the seat. In this situation, the backflow of cement slurry can be prevented only by using sealing elements and locking device on the casing plug instead of by using drill pipe plug. Fifth, field tests show that the cement top of test wells is only 24 m higher than the designed value while that of offset wells is 59 m higher. Obviously, the former is 50% less than the latter. In conclusion, this newly developed semi-hollow casing plug matches well with hangers, having no negative effects on cementing operation, so the cement top after cementing can be well controlled. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Oil well drilling equipment

Controlled terms: Applications - Cementing (shafts) - Cements - Design - Drill pipe - Drilling fluids - Drills - Failure analysis - Infill drilling - Locks (fasteners) - Manufacture

Uncontrolled terms: Cement slurry - Cementing operations - Hanger plug - Locking devices - Locking mechanism - Research results - Sealing element - Semi-hollow casing plug

Classification code: 412.1 Cement - 451.2 Air Pollution Control - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 537.1 Heat Treatment Processes - 603.2 Machine Tool Accessories

Numerical data indexing: Percentage 5.00e+01%, Size 2.40e+01m, Size 5.90e+01m

DOI: 10.3787/j.issn.1000-0976.2018.11.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

81. A post-data flow analysis method for the Puguang Intelligent Gas-field Project

Accession number: 20185106260093

Title of translation:

Authors: Chen, Weiguo (1); Yi, Jianfeng (1); Zhang, Hanwei (2); Fu, Peichen (1); Li, Tao (2); Yang, Xiaoyan (2)

Author affiliation: (1) Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457000, China; (2) Puguang Branch of Sinopec Zhongyuan Oilfield Company, Dazhou; Sichuan; 635000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: October 25, 2018

Publication year: 2018

Pages: 47-51

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Post data collection is an important part in the construction of data resource center, and it is directly related to the construction quality and level. The data collection in the Puguang Gas Field is faced with heterogeneous construction, data non-sharing, different standard, multi-source collection, redundant storage and difficult management of different professional data bases. In order to provide data services and applications for production posts and full service chains and realize the integrated data collection, storage, management and utilization in the post, the post business relationship, data flow business process and business data elements were analyzed based on Sinopec's exploration and development data model and the structure design of source data, combined with actual business of the Puguang Gas Field. Then, the transmission and interaction of data were investigated with a closely related set of data as the data set. In this way, a post data flow analysis method which meets the construction requirements of the Puguang Intelligent Gas-field Project was established, and a complete set of asset-based data resource management system was developed. Finally, they were applied on site for verification. It is indicated that compared with the traditional data analysis methods, the post-data flow analysis method is more innovative with better application effect. It realizes unified collection, centralized storage, shared use and unified management of the post data with the business process as the driving force and the post scenario as the verification. These research results provide the technical route, feasible methods and standard templates and they are worth popularizing and applying. **Keywords:** Puguang Gas Field; Intelligent; Post; Data flow; Data set; Analysis method; Coding; Application; Integration of data collection, storage, management and utilization © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Information management

Controlled terms: Applications - Data acquisition - Data flow analysis - Data integration - Data transfer - Digital storage - Gas industry - Gases - Petroleum prospecting - Project management - Storage management

Uncontrolled terms: Analysis method - Coding - Data collection - Data flow - Data set - Intelligent - Post - Puguang gas field

Classification code: 451.2 Air Pollution Control - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 722.1 Data Storage, Equipment and Techniques - 723.2 Data Processing and Image Processing - 723.3 Database Systems - 912.2 Management

DOI: 10.3787/j.issn.1000-0976.2018.10.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

82. Innovative management of shale gas development in China: Summary of successful scenarios

Accession number: 20182905565482

Authors: Kong, Lingfeng (1); Yang, Zhen (1); Li, Huaqi (1)

Author affiliation: (1) CNPC Group Ltd., Beijing; 100007, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 1

Issue date: January 25, 2018

Publication year: 2018

Pages: 142-149

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Successful practices of Fuling, Changning-Weiyuan and Zhaotong national shale gas demonstration zones have mainly benefitted from the innovation of fundamental geologic theories, supporting engineering technologies and essential organizing management. The innovative management of shale gas exploration and development include two levels of government and enterprises, in the former of which system innovation is the essential to setting new rules adaptable for shale gas characteristics and industrial development requirement and to establishing a management system for the shale gas sector with a fully-open market from upstream, to middle- and downstream, while in the latter of which innovation mainly manifest in management system, organization and methodologies; and through four types of new management modes, integrated geological studies & engineering designs and integrated ground construction & downhole operation, the high efficiency and integration of "team working" have been fully exploited to promote the advances in technologies and progresses in the shale gas sector. In conclusion, to achieve the goal of shale gas productivity in the 13th Five-Year Plan, the government should further free minds in the aspects of resources management, environmental regulation, industrial supporting policies, etc., while enterprises should improve their management efficiency, adopt more measures for cost decreasing and benefit increasing, promote the factory-like operation mode in drilling, completion and fracturing projects, and improve the marketability degree of non-core engineering and production services. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Shale

Controlled terms: Commerce - Cost engineering - Design - Efficiency - Environmental regulations - Gas industry - Gases - Geological surveys - Geology - Human resource management - Petroleum prospecting - Project management - Shale gas

Uncontrolled terms: China - Downhole operation - Industrial supports - Innovation system - Management modes

Classification code: 454.2 Environmental Impact and Protection - 481.1 Geology - 512.1.2 Petroleum Deposits :

Development Operations - 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics - 912.2

Management - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.01.018

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

83. Natural gas production peaks in China: Research and strategic proposals

Accession number: 20182905565465

Authors: Lu, Jialiang (1); Zhao, Suping (1); Sun, Yuping (1); Tang, Hongjun (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China

Corresponding author: Sun, Yuping(sunyuping01@petrochina.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: January 25, 2018

Publication year: 2018

Pages: 1-9

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 22

Main heading: Petroleum prospecting

Controlled terms: Coal bed methane - Coal deposits - Decision making - Gas hydrates - Gas industry - Gases - Investments - Methane - Natural gas - Natural gas well production - Natural gasoline plants - Public utilities - Shale gas - Strategic planning - Tight gas

Uncontrolled terms: China - Conventional gas (including tight gas) - Cumulative gas productions - Development characteristics - Exploration and development - Forecasting modeling - Investment decision making - Suggestions

Classification code: 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 513.2 Petroleum Refineries - 522 Gas Fuels - 804.1 Organic Compounds - 912.2 Management

DOI: 10.3787/j.issn.1000-0976.2018.01.001

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

84. Key technologies for directional well drilling in high-pressure anhydrite salt layers

Accession number: 20183905863720

Authors: Nie, Zhen (1); Zhang, Zhenyou (2); Luo, Huihong (2); Zou, Ke (2)

Author affiliation: (1) CNPC Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) Halfaya Oil Field Base Camp, Training Centre, Office No.1 Ai-kahla District Missan Governorate, Iraq

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 5

Issue date: May 25, 2018

Publication year: 2018

Pages: 103-110

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Jeribe-Kirkuk reservoir is one of the major payzones in the Halfaya Oil Field, Iraq, and its overlying 500 m-thick Lower Fars anhydrite salt layer with a formation pressure coefficient of 2.25 acts as the cap-rock sealing. That's just why the first Jeribe-Kirkuk directional well experienced multiple drill pipe stickings and two side trackings, and the first horizontal well had to be completed with casing ahead of the schedule. Obviously, the drilling in the Lower Fars high-pressure anhydrite salt layer is faced with severe challenges. In this paper, the Lower Fars anhydrite salt layer was analyzed from the aspects of mechanical property, pore pressure, ground stress and rock mineral characteristics. Then, a mathematical model and criterion rules were established for borehole stability and wellbore deformation in the Lower Fars formations with different lithologies and the wellbore deformation was simulated in the process of well drilling. Finally, the high-density saturated salt water drilling fluid was specially developed for directional drilling in anhydrite salt layers, and the well trajectory and drilling program of directional wells were optimized. The following results were obtained. First, the most unstable zone in the Lower Fars anhydrite salt layer is composed of mudstones. As to the main reason for drill pipe sticking, the increase of rheological property after mudstone hydration leads to tight holes, so the neighboring anhydrites and salt rocks are pulled to collapse, which ultimately results in drill pipe sticking. Second, borehole deformation and instability in the Lower Fars layer intensify with the increase of hole deviation angle and wellbore opening time, and the risk of borehole instability increases sharply with the increase of wellbore opening time. Third, polyamine inhibitor BZ-HIB and polymer thinner JNJ are selected to optimize the formula of the high-density saturated salt drilling fluid, thus making its inhibition and rheology during the drilling in anhydrite salt layer improved effectively. Fourth, the kick off point of the Jeribe-Kirkuk directional well is moved upward to Upper Fars from Lower Fars. Specifically, the buildup section is in Upper Fars, the angle holding section is in Lower Fars, and the hole deviation angle and directional section length in Lower Fars are decreased, so the risk of drill pipe sticking is

reduced. So far, it has been practically applied to 22 wells, showing that the drilling complexities in Ø311.2 mm hole have been effectively controlled. In 2016, the average drilling time was 35.8 days, 52.8% shorter than that in 2015, and the average ROP was increased by 122% from 3.3 m/h to 7.33 m/h. In conclusion, technological optimization has achieved good application results. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Well drilling

Controlled terms: Boreholes - Boring - Deformation - Directional drilling - Drill pipe - Drilling fluids - Drills - Horizontal wells - Infill drilling - Minerals - Oil fields - Oil well drilling equipment - Oil wells - Sedimentary rocks

Uncontrolled terms: Iraq - Salt layers - Saturated salts - Well trajectory - Wellbore

Classification code: 482.2 Minerals - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 603.2 Machine Tool Accessories - 604.2 Machining Operations

Numerical data indexing: Age 9.81e-02yr, Percentage 1.22e+02%, Percentage 5.28e+01%

DOI: 10.3787/j.issn.1000-0976.2018.05.012

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

85. Impact performance optimization of a YDC valve-type double action hydraulic hammer

Accession number: 20183805830749

Authors: Huang, Xueqin (1); Hu, Gui (1); Meng, Qingkun (1); Zheng, Xiaofeng (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 3

Issue date: March 25, 2018

Publication year: 2018

Pages: 87-95

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: A YDC type hydraulic hammer is a new valve-type double action hydraulic hammer suitable for oil and gas well drilling. It is hard to find out the optimal matching relationship between various factors based on experience and experiments, for the matching relationships of inner pressure is complex and the impact performance is influenced by many factors. In this paper, the operating principle of the YDC type hydraulic hammer was investigated, the force applied to the main moving components (valve core and hammer) was analyzed and the dynamic model of valve core and hammer in each operating stage was established. Then, a performance optimization and design software was developed on the platform of the Matlab software, and the performance parameters calculated in the software were compared with the laboratory test results. And the following research results were obtained. First, single impact energy, impact frequency and impact power increase with the increase of pump displacement or with the decrease of throttle nozzle diameter, and they increase firstly and then decrease with the increase of area difference between the upper and lower chambers. Second, with the increase of hammer weight, single impact energy and impact power increase and impact frequency decreases slowly. Third, with the increase of hammer travel, single impact energy presents an increasing trend, impact frequency presents a decreasing trend and impact power basically remains unchanged. Fourth, with the increase of valve core weight, single impact energy presents an increasing trend while both impact frequency and impact power decrease. Fifth, the parameter combination corresponding to the optimal single impact energy and impact power is a5b1c5d4e3f2, and the effect of displacement on single impact energy and impact power is the greatest. It is concluded that under the existing displacement and pressure of drilling pumps, the impact performance of the hydraulic hammer can be increased effectively by improving the structure of the hydraulic hammer, thus to increase its work displacement. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 25

Main heading: Hammers

Controlled terms: Dynamic models - Infill drilling - MATLAB - Software testing - Well drilling

Uncontrolled terms: Displacement - Force analysis - Hydraulic hammers - Impact performance - Influence rule - Modeling softwares - Parameter combination - Valve cores

Classification code: 511.1 Oil Field Production Operations - 605.2 Small Tools, Unpowered - 723.5 Computer Applications - 921 Mathematics

DOI: 10.3787/j.issn.1000-0976.2018.03.011

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

86. Geological characteristics and exploration orientation of Mid-Permian natural gas in the Sichuan Basin

Accession number: 20182905565466

Authors: Zhang, Jian (1); Zhou, Gang (1); Zhang, Guangrong (1); Li, Guohui (1); Wang, Hua (1)

Author affiliation: (1) PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 1

Issue date: January 25, 2018

Publication year: 2018

Pages: 10-20

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the Sichuan Basin, the less-proved natural gas resources in the Mid-Permian strata are highly potential for exploration. In this paper, sedimentary and reservoir characteristics of Mid-Permian natural gas in the basin were analyzed. On this basis, researches were conducted on hydrocarbon supply, reservoir and trap types, preservation conditions, structure, and phases and patterns of hydrocarbon accumulation to highlight the controlling factors for the enrichment of Mid-Permian natural gas in the basin and the orientation of future exploration operations. Research results are as follows. First, the Mid-Permian natural gas reservoirs in the Sichuan Basin are characterized by multiple sources from different layers, existence of reservoirs and traps of various types, formation of different reservoirs at different stages and other features. Second, hydrocarbon source rocks are predominantly in the Permian strata. There are also some hydrocarbon source rocks in the Lower Cambrian Qiongzhusi and Lower Silurian Longmaxi Fms. The gas-generation center of Mid-Permian Fms lies in the northwestern and central-southern parts of the Sichuan Basin. With a gas-generation intensity of 26×10^8 - 44×10^8 m³/km², it has the necessary material basis available for the formation of large-or medium-sized gas fields. Third, the Mid-Permian strata contain dolomite and karst fractured-vuggy limestone reservoirs, with the former distributed predominantly in grain beach or around basement faults, and the latter distributed extensively in middle and upper parts of the Maokou Fm. Fourth, the presence of high-quality hydrocarbon source rocks, and dolomitization and epigenetic karstification of reservoirs are controlling factors for the distribution of large-and medium-sized gas fields. Fifth, the Indosinian paleo-uplifts are favorable zones for the accumulation of hydrocarbons, and the Himalayan is the key period of oil and gas adjustment. In conclusion, in the Mid-Permian Qixia Fm, the favorable exploration zones are represented by platform margin beaches mainly along the Guanyuan-Jiangyou and Dujiangyan areas in the NW Sichuan Basin, followed by platform margins in the SW Sichuan Basin, and intraplatform beaches predominantly in the Gaoshiti-Moxi area in the central and southern Sichuan Basin. Besides, in the Mid-Permian Maokou Fm, the favorable exploration zones are mainly the Luzhou-Neijiang area, followed by the Shuangyushi-Nanchong, Wolonghe-Shizhu, Gaoshiti-Moxi, Dazhou-Kaijiang, Jiulongshan and other areas. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 36

Main heading: Petroleum prospecting

Controlled terms: Beaches - Energy resources - Gas generators - Gas industry - Gases - Hydrocarbons - Lime - Natural gas - Natural gas deposits - Petroleum reservoirs - Quality control - Rocks

Uncontrolled terms: Dolomite - Gas reservoir - Hydrocarbon source rocks - Karst reservoirs - Permian - Reservoir formation - Sichuan Basin

Classification code: 407.3 Coastal Engineering - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 804.1 Organic Compounds - 804.2 Inorganic Compounds - 913.3 Quality Assurance and Control

DOI: 10.3787/j.issn.1000-0976.2018.01.002

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

87. Logging-based identification and evaluation of karst fractures in the eastern right bank of the amu darya river of turkmenistan

Accession number: 20183905879909

Authors: Zhang, Shudong (1); Ren, Xingguo (2); Luo, Li (1); Guo, Tingliang (1); Liang, Xusheng (1)

Author affiliation: (1) Southwest Branch, CNPC Logging Company Limited, Chongqing; 400021, China; (2)

Geological Exploration Development, Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610051, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 6

Issue date: June 25, 2018

Publication year: 2018

Pages: 53-58

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Carbonate gas reservoirs in the eastern area on the Right Bank of the Amu Darya River, Turkmenistan, are of low-porosity and with developed fractures. In this area, fractures control reservoir properties and natural gas production, and karst fractures are the most important kind of fractures, so their identification and evaluation is quite necessary. In this paper, fracture types were identified and their occurrence was extracted by using conventional logging and image logging data after core calibration. Then, the distribution characteristics of karst fractures and their controlling effect on reservoirs were studied according to the identification results. And the following research results were obtained. First, karst fractures are mainly of high angle with the characteristic of mono system and the interactive relation of genesis. Second, they are mainly distributed in the upper XVhp layer of Callovian–Oxford Stage and the lower XVa2–XVI layer. Third, they are the main effective fractures in this area. The dissolved pores are connected effectively through the expanded karst fractures by dissolution, and consequently reservoirs of high porosity and permeability are formed and they are the important reservoir type and high-yield gas reservoir in this area. Fourth, karst fractures are related to high yield wells and high yield layers in this area, and they also control the distribution of high yield reservoirs in the lower part of Callovian–Oxford Stage. It is concluded that by virtue of imaging logging and conventional logging data, karst fractures, unfilled fractures, semi-filled fractures and fully filled fractures can be identified and evaluated better. Furthermore, the identification and evaluation of karst fractures deepens the understanding on fractured reservoirs in this area, improves the reservoir evaluation effect, and provides the basis for the target horizon and azimuth optimization of horizontal wells and highly deviated wells. And it is also indicated that the reservoirs with developed karst fractures are the subsequent important drilling targets. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Fracture

Controlled terms: Deflected boreholes - Gases - Horizontal wells - Landforms - Natural gas - Natural gas well production - Petroleum reservoir evaluation - Petroleum reservoirs - Porosity

Uncontrolled terms: Eastern area - Gas reservoir - Imaging logging - Log response - Natural-gas production - Turkmenistan

Classification code: 481.1 Geology - 512 Petroleum and Related Deposits - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.06.007

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

88. Research progress of symbiotic accumulation of coal measure gas in China

Accession number: 20183905876124

Authors: Qin, Yong (1)

Author affiliation: (1) MOE Key Laboratory of CBM Resources and Accumulation Process, China University of Mining and Technology, Xuzhou; Jiangsu; 221008, China

Corresponding author: Qin, Yong(yongqin@cumt.edu.cn)

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Abbreviated source title: Natur. Gas Ind.

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Issue date: April 25, 2018

Publication year: 2018

Pages: 26-36

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Coal measure gas (CMG), referring to natural gas stored in coal measures, as well as its existence, exploration and production, has been highly concerned recently in natural gas sector in China, and pilot tests of which have been succeeded with some achievements. To provide new geological references, this paper discussed the research progress in CMG co-existence and pooling factors in the respects of the tightening mechanism of coal measure sandstone reservoirs, CMG co-existence and gas pooling assemblages, the superimposed CMG system, and so on. The following findings were obtained. (1) The particularities of CMG geological conditions are shown in three aspects: First, the occurrence and reservoir lithology of CMG are diverse, and the accumulation of sandstone gas in coal measures may be different from that of conventional sandstone gas. Second, the sedimentary environment of coal measures causes the frequent and thin interbedding with various lithologic reservoirs, strong cyclicity and complex gas-water relationship, and the Surat-type CMG is worthy of attention. And third, the sandstone reservoirs in coal measures are embedded in the wide overlying mudstones, the special source-reservoir match and composite gas reservoirs need to develop adaptive co-exploration and co-production technology. (2) The coal measures are rich in organic matters, and a large number of the organic acids are formed during gas generation from the source rocks, which are important factors for the densification of the sandstone reservoirs in coal measures. And the sandstone reservoirs in coal measures may be characteristic of self generating and self storing gas and adsorption to a certain extent, and their physical properties can be improved by organic detritus in the reservoirs. (3) The sedimentology of coal measures defines four generalities for favorable CMG accumulation, but effect of the gas-generating intensity, gas migration system, formation fluid energy and effective regional caprock thickness to the accumulation are variable. The natural gas generated in source rocks is re-allocated with a special migration system in a complex source-reservoir system, which is an important basis of CMG accumulation. (4) The superimposition of the gas-bearing system is one of the leading problems in CMG research. In recent years, the logging response identification technology of key strata and the superposition identification method of the gas-bearing system have been further developed. It is found that there are three typical types of fluid pressure curves in coal measures. At the same time, the CMG co-accumulation in the whole sense requires a certain threshold depth. Based on the progress above, the theory of CMG accumulation has been improved and deepened, which is helpful in providing more pertinent suggestions for the development of the joint CMG exploration and mining technology. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 86

Main heading: Natural gas well production

Controlled terms: Coal - Gas bearings - Gas generators - Gas industry - Gases - Lithology - Natural gas - Natural gas wells - Oil bearing formations - Organic acids - Petroleum prospecting - Petroleum reservoirs - Sandstone - Sedimentology

Uncontrolled terms: Bearing systems - China - Co-production - Geological conditions - Pooling factors - Sandstone reservoirs

Classification code: 481.1 Geology - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 524 Solid Fuels - 601.2 Machine Components - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.04.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

89. Calculation and inducement of lacuna in the Mid-Permian Maokou Fm of the Sichuan Basin

Accession number: 20182905565467

Authors: Jiang, Qingchun (1); Hu, Suyun (1); Jiang, Hua (1); Zhai, Xiufen (1); Ren, Mengyi (1); Chen, Xiaoyue (1); Li, Qiufen (1); Zhang, Yunbo (2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) iRock Technologies, Beijing; 100094, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Erosion of carbonate strata not only can reflect the karst landform, but also can reveal the characteristics of carbonate karst reservoirs indirectly. In the Sichuan Basin, the quantity and root causes of lacuna in the top strata of the Maokou Fm are unclear. In this paper, the features of such stratigraphic lacuna were analyzed qualitatively. Then, in accordance with the spectral transformation of GR logs and the characteristics of cycle in the Maokou Fm penetrated by four typical wells, the Milankovich cycles of the logs were identified. Then they were used for quantitative calculation of erosion quantity and for highlighting the root causes for the stratigraphic lacuna. According to the research results, the Mao-4 Member is residual in the Yibin-Ya'an-Jiangyou area and the Shizhu area, but missing in the other parts of the Sichuan Basin with a stratigraphic lacuna intensity gradually increasing from the southern part to the central part and to the northern parts of the basin. Besides, the stratigraphic lacuna of the Maokou Fm varies from 0 to 200 m-for example, 0-60 m in the southwestern and northeastern parts of the basin, and 140-200 m in the southern, central and northern parts of the basin. Moreover, formation denudation occurred at the end of the Maokou Period was induced predominantly by erosion generated as the sea level fell during the glacial period, especially in the northern part of the basin. Also, the Mid-Permian karst landform inherited the sedimentary features of being high in the southwest and low in the northeast. In the areas from the southwestern to central and to the northern Sichuan Basin, the karst landform transits from erosion highlands to karst upper and lower slopes, coinciding well with the sedimentary features of the Wujiaping Period. In conclusion, the Milankovich cycles can be used to calculate the stratigraphic erosion in carbonate formations efficiently and accurately. The technique can be extended to the restoration of stratigraphic erosion in other marine basins. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 40

Main heading: Landforms

Controlled terms: Carbonation - Erosion - Glacial geology - Sea level - Sedimentology - Stratigraphy

Uncontrolled terms: Genesis discussion - Glacial period - Milankovich cycle - Permian - Quantitative calculation - Sichuan Basin

Classification code: 471.1 Oceanography, General - 481.1 Geology - 802.2 Chemical Reactions

Numerical data indexing: Size 0.00e+00m to 6.00e+01m, Size 1.40e+02m to 2.00e+02m

DOI: 10.3787/j.issn.1000-0976.2018.01.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

90. Key technologies and application of the Mobile Open Service Platform in the Puguang Intelligent Gas-field Project

Accession number: 20185106260094

Title of translation:

Authors: Zhang, Qingsheng (1); Meng, Yuping (1); Lü, Qinglin (2); Long, Fei (1); Li, Jinxian (1); Lei, Jinjing (2)

Author affiliation: (1) Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457000, China; (2) Puguang Branch of Sinopec Zhongyuan Oilfield Company, Dazhou; Sichuan; 635000, China

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: An auxiliary intelligent decision system is one of the important parts in the Puguang Intelligent Gas-field Project, and its mobile application acts as a primary approach. But this will be difficult to realize due to the variety of mobile terminal types in the field. In view of this, based upon the analysis of the involved key technologies, an efficient, rapid and flexible Mobile Open Service Platform (MOSP) was researched and developed, integrating both HTML5 and Web component technologies. This system provides a bidirectional interaction mechanism between HTML5 and native mobile development platform, promising adaptability to all mobile terminals. According to this system, the Puguang Intelligent Gas-field Mobile Application Platform was successfully developed, including six functional modules of Portals, Exploration, Development, Production, Conference and Videos. Multiple existing intelligent application systems are integrated through a consistent interface and the relevant hardware resources are invoked from different types of mobile terminals to achieve the goal of development-once-run-anywhere. It is concluded that the MOSP's key technologies and successful application practices in typical scenarios provide a reference and solution to mobile application development in other oil and gas fields. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 10

Main heading: Oil field development

Controlled terms: Computer terminals - Gas industry - Gases - HTML - Mobile computing - Petroleum prospecting

Uncontrolled terms: Development frameworks - Gas fields - HTML5 - Hybrid development - Mobile applications - Mobile video - MOSP - Puguang gas field - Web components

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 722.2 Computer Peripheral Equipment

DOI: 10.3787/j.issn.1000-0976.2018.10.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

91. An architectural study on the blocking zone of braided river tight sandstone reservoirs: A case study on the tight sandstone gas reservoirs of the 8th Member, Shihezi Fm, Middle Permian in the Sulige Gas Field, Ordos Basin

Accession number: 20184706088030

Title of translation:

Authors: Liu, Qunming (1); Tang, Haifa (1); Lü, Zhikai (1); Wang, Zelong (1); Fu, Ninghai (1); Guo, Zhi (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.

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Traditional architectural studies on blocking zones could be usually found on analyzing the spatial relationship between remaining oil and intercalations to guide the potential tapping of remaining oil, while few literatures could be searched for focusing on the architecture of blocking zones in the gas reservoirs the fluidity of which is much better than that of oil reservoirs. In this paper, the braided river reservoirs in the Sulige Gas Field, Ordos Basin, were taken as examples. Under the guidance of reservoir architectural hierarchical analysis theory, based on field outcrop section and abundant analysis of actual horizontal wells, combined with production performance analysis and gas reservoir engineering verification, the existing evidence, grade classification, genetic type and scale parameters of blocking zones were studied, and its architecture model was established and verified. And the

following research results were obtained. First, there is a blocking zone of muddy or fine-grained sediment in the effective composite sandbody of braided river in the Sulige Gas Field, and it is the main factor leading to the production performance difference between vertical well and horizontal well and the mismatch between the gas drainage radius of vertical well and the measured length of effective sandbody. Second, blocking zones of large scale braided rivers can be divided into three architectural grades: Grade I (between composite channel sandbody), Grade II (between channel bar single sandbody) and Grade III (inside channel bar single sandbody). Grade II blocking zone includes three genetic types, i.e., inter-channel mudstone, floodplain mudstone and tight sandstone, and Grade III blocking zone includes two genetic types, i.e., silt layer and channel on bar. Third, the parameter values of different blocking zones are more different, such as geometry, scale and apparent thickness. On average, 5-7 diverse blocking zones can be drilled in 1000 m horizontal section of horizontal wells in the gas reservoir of the 8th Member of Lower Shihezi Fm of Middle Permian in the Sulige Gas Field, and the apparent thickness of each blocking zone is 10-200 m. Fourth, the blocking zone superposition patterns can be divided into 4 architectural models, i.e., isolated model, lateral superposition model, vertical stacking superposition model and vertical cutting superposition model. Fifth, compared with vertical well development, horizontal well development can improve the producing degree of natural gas reserves in the Sulige Gas Field by 13.02% through penetrating the blocking zones. It is recommended to carry out 6-8 fracturing stages in 1 000 m horizontal section. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Natural gas wells

Controlled terms: Architecture - Bars (metal) - Gas engineering - Gas industry - Gases - Horizontal wells - Metamorphic rocks - Natural gas - Petroleum reservoir engineering - Petroleum reservoirs - Proven reserves - Rivers - Sandstone - Tight gas

Uncontrolled terms: Architecture analysis - Braided river - Genetic type - Ordos Basin - Sulige gas field

Classification code: 402 Buildings and Towers - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 535.1.2 Rolling Mill Practice

Numerical data indexing: Percentage 1.30e+01%, Size 1.00e+01m to 2.00e+02m, Size 1.00e+03m

DOI: 10.3787/j.issn.1000-0976.2018.07.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

92. An experimental study on gas-liquid sulfur two-phase flow in ultradeep high-sulfur gas reservoirs

Accession number: 20185106260097

Title of translation: -

Authors: Gu, Shaohua (1, 2); Shi, Zhiliang (1, 2); Hu, Xiangyang (1); Shi, Yunqing (1, 2); Qin, Shijiang (3); Guo, Xiao (3)

Author affiliation: (1) Sinopec Key Laboratory for Marine Oil & Gas Field Development, Beijing; 100083, China; (2) Sinopec Exploration & Production Research Institute, Beijing; 100083, China; (3) State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

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Abbreviated source title: Natur. Gas Ind.

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Pages: 70-75

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: During the development of ultradeep high-sulfur gas reservoirs, gas-liquid sulfur co-existence occurs in reservoirs, but its effect on gas well productivity has not been verified by experimental data. In this paper, a set of real-time test devices for gas-liquid sulfur two-phase flow displacement under high temperature and high pressure were developed, and the corresponding test process was formulated. Then, the sampling cores of Yuanba Gas Field in the Sichuan Basin were selected for gas-liquid sulfur two-phase displacement experiments. The relative permeability of gas and liquid sulfur was calculated by using non-steady state method and the gas-liquid sulfur relative permeability curve was plotted. Finally, the laws of gas-liquid sulfur two-phase flow were studied quantitatively. And

the following research results were obtained. First, the co-flow zone of gas and liquid sulfur is relatively narrow. When the critical liquid sulfur saturation is higher than 40%, the liquid sulfur saturation near the wellbore reaches the critical flowing saturation of liquid sulfur, so as to hinder the flowing of gas near the wellbore. Second, the gas-liquid sulfur relative permeability curve varies with the confining pressure. With the increase of confining pressure, both gas relative permeability and liquid sulfur relative permeability decrease. Third, with the increase of displacement pressure difference, the gas flowing speed increases, its sulfur carrying capacity increases and both gas relative permeability and liquid sulfur relative permeability increase slightly. In conclusion, the quantitative research on gas-liquid sulfur twophase flow is realized based on the establishment of gas-liquid sulfur two-phase relative permeability curve, which can be used to evaluate the productivity of ultradeep sulfur gas wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Two phase flow

Controlled terms: Boreholes - Gas industry - Gas permeability - Gases - Liquids - Multiphase flow - Natural gas well production - Natural gas wells - Oil field equipment - Petroleum reservoirs - Productivity - Rock pressure - Sour gas - Sulfur

Uncontrolled terms: Gas fields - Liquid sulfur - Relative permeability curves - Stress sensitivity - Ultra deeps - Velocity sensitivity

Classification code: 502.1 Mine and Quarry Operations - 511.2 Oil Field Equipment - 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1 Fluid Flow, General - 804 Chemical Products Generally - 931.2 Physical Properties of Gases, Liquids and Solids

Numerical data indexing: Percentage 4.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.10.010

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

93. Analysis on the load and stress of the concrete external walls of LNG storage tanks in stable working conditions

Accession number: 20191006600875

Title of translation: LNG

Authors: Li, Zhaoci (1); Tao, Jingying (1); Leng, Ming (1); Li, Xiaohong (1); Zhang, Na (1)

Author affiliation: (1) National Engineering Laboratory for Pipeline Safety/Beijing Key Laboratory of Urban Oil and Gas Distribution Technology, China University of Petroleum, Beijing; 102249, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Publication year: 2018

Pages: 89-96

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: LNG tanks are structurally complex with many kinds of components and complicated forces, so to analyze the stress distribution at each part of a tank under extreme working conditions is of great significance to studying the failures of full-containment concrete roof (FCCR) LNG storage tanks. In this paper, classified calculation and equivalent treatment were conducted on the force load system of the tank body by taking the variable load on the tank into consideration after the roof structure of the tanks was simplified. Then, the combined working conditions of tank roof load, pre-stressed load and other variable loads in the ultimate limit state of bearing capacity were established, and the finite element model for 1/4 part of the simplified pre-stressed concrete tank was developed by using the ANSYS software. Finally, various loads on the tank were equivalently treated by conducting the structured mesh processing and the grid encryption processing in the stress concentration area, and the temperature and stress distribution on the tank in the ultimate limit state of bearing capacity were analyzed. And the following research results were obtained. First, in the working condition of an empty tank, the maximum compression and tension stresses on the tank roof are located at the bearing ring of the tank and the maximum strain lies at the position of maximum tension stress -2.81 MPa. Second, in the working condition of an empty tank, both the maximum compression stress and the maximum

tension pressure on the cap and the maximum strain are located at the outer edge of the connection position between the tank floor and the cap, where cracking tends to happen easily. Third, in the working condition of an empty tank, only the stress on the tank roof and cap reaches the failure limit of concrete while the stress on the other parts of the tank is in the limit range of material safety. Fourth, in the working condition of a full tank with wind load or snow load, the whole concrete wall of the tank reaches the strength limit of concrete material. Fifth, in the working condition of a full tank with wind load or snow load, the concrete material at connection position between the tank floor and the cap is in the state of tension stress which is much higher than the strength limit, so the small cracks in this position tend to propagate easily in a certain condition. Sixth, the compression stress on a tank at the position of hot angle protection reaches the compressive strength limit of concrete. In conclusion, the research results provide a theoretical reference for analyzing the failures of FCCR LNG storage tanks. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Occupational risks

Controlled terms: Aerodynamic loads - Bearing capacity - Compressive strength - Concrete tanks - Concretes - Cryptography - Finite element method - Floors - Liquefied natural gas - Loading - Roofs - Snow - Storage (materials) - Stress concentration - Structural dynamics - Wind stress

Uncontrolled terms: Equivalent treatment - External walls - Full containment - LNG storage tank - Ultimate limit state

Classification code: 402 Buildings and Towers - 408 Structural Design - 412 Concrete - 443.1 Atmospheric Properties - 443.3 Precipitation - 523 Liquid Fuels - 651.1 Aerodynamics, General - 691.2 Materials Handling Methods - 694.4 Storage - 921.6 Numerical Methods

Numerical data indexing: Pressure -2.81e+06Pa

DOI: 10.3787/j.issn.1000-0976.2018.11.012

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

94. Diffusion process and capacity of Longmaxi shale gas in the basin-margin transition zone of SE Chongqing and their controlling factors

Accession number: 20191306691380

Title of translation:

Authors: Tang, Ling (1, 2); Song, Yan (1, 2); Jiang, Zhenxue (1, 2); Tang, Xianglu (1, 2); Li, Zhuo (1, 2); Li, Qianwen (3); Chang, Jiaqi (1, 2); Sun, Yue (1, 2)

Author affiliation: (1) Unconventional Natural Gas Institute, China University of Petroleum, Beijing; 102249, China; (2) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing; 102249, China; (3) Sinopec Petroleum Exploration & Production Research Institute, Beijing; 100083, China

Corresponding author: Song, Yan(sya@petrochina.com.cn)

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The studies on the diffusion process and capacity of shale gas and their controlling factors are of great significance to reveal the shale gas accumulation mechanism and guide the selection of shale gas exploration areas. In this paper, we took the shale of Lower Silurian Longmaxi Fm in the southeastern (SE) Sichuan Basin and its basin-margin transition zone (hereinafter referred to as the basin- margin transition zone of SE Chongqing) as an example. The diffusion process of shale gas was simulated by using the field desorption experiment. Then, the diffusion process of shale gas was qualitatively analyzed and the diffusion capacity of shale gas was evaluated quantitatively by means of laboratory experiments, e.g. X-ray diffraction (XRD) analysis, total organic carbon (TOC) test, Low-temperature nitrogen adsorption experiment, isothermal adsorption experiment and scanning electron microscope (SEM) observation. Finally, the main factors controlling the diffusion capacity of shale gas was discussed. And the following research results were obtained. First, the diffusion process of shale gas in the upper member of Longmaxi

Fm in this transition zone is obviously different from that in the lower member, and the diffusion capacity of shale gas in the lower member of Longmaxi Fm is much lower than that in the upper member. The diffusion capacity of the Lower Longmaxi Fm is obviously weaker than that of the Upper. Second, the diffusion capacity of shale gas is mainly dominated by temperature, pressure and shale properties, among which temperature and pressure are the most important external factors. Third, organic content is the most important internal factor controlling the diffusion capacity of shale gas. As the organic content increases, the specific surface area of shale increases, the absorption capacity of shale enhances and the diffusion capacity of shale gas decreases. Fourth, to some extent, the diffusion capacity of shale gas is affected by rock mineral compositions and pore structures. The diffusion capacity of shale gas is in the negative correlation with quartz contents and pyrite contents, in the positive correlation with feldspar contents, and in no significant correlation with carbonate mineral contents and clay mineral contents. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Shale gas

Controlled terms: Diffusion - Feldspar - Gas adsorption - Gases - Geological surveys - Organic carbon - Petroleum prospecting - Pore structure - Pyrites - Scanning electron microscopy - Temperature - X ray diffraction analysis

Uncontrolled terms: Controlling factors - Diffusion process - Sichuan Basin - Silurian - Total Organic Carbon - Transition zones

Classification code: 481.1 Geology - 482.2 Minerals - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 641.1 Thermodynamics - 802.3 Chemical Operations - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.12.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

95. Full life-cycle management of natural gas customers based on SOM (self-organizing maps) neural network clustering

Accession number: 20191306691395

Title of translation: SOM

Authors: Sun, Ming (1)

Author affiliation: (1) PetroChina Coalbed Methane Co., Ltd., Beijing; 100028, China

Corresponding author: Sun, Ming(sunming01@petrochina.com.cn)

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Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Natural gas sales companies must focus on the full life-cycle management of gas customers from many perspectives so as not only to improve the market competitiveness, but to enhance customer value and loyalty. The key to such solution lies in the scientific and reasonable classification of customers. However, the current classification methods fail to reflect the status of customer value, which is not conducive to targeted customer management. In view of this, SOM neural network clustering was adopted to establish a network learning algorithm, which was then verified by an empirical analysis of 546 customers belonging to a certain giant gas company in Southwest China. In this scenario, the three important indexes of gross profit margin, time and growth rate of gas consumption were selected to analyze the characteristics of various customer groups and their different values in four stages of customer full life-cycle, i.e., Introduction, Growth, Maturity, and Decline. On this basis, strategies were put forward respectively at such four stages to acquire and reach customers, provide differential service, enhance customer value, and offset the churn. In particular, different and specific sales strategies should be adopted at each stage so as to identify and serve important and potential customers, thus improving a company's market competitiveness. In conclusion, this method

can classify natural gas customer groups effectively and accurately and manage the customer full lifecycle and lifetime values scientifically and reasonably. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Sales

Controlled terms: Commerce - Competition - Conformal mapping - Gas industry - Gases - Natural gas - Natural gasoline plants - Public utilities - Self organizing maps

Uncontrolled terms: Clustering - Customer values - Development strategies - Differential services - Gas customer - Offset - Som neural networks

Classification code: 513.2 Petroleum Refineries - 522 Gas Fuels - 911.2 Industrial Economics

DOI: 10.3787/j.issn.1000-0976.2018.12.019

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

96. An experimental analysis on the elastic mechanical parameters of weakly-consolidated nondiagenetic gas hydrate sediments

Accession number: 20191306691381

Title of translation:

Authors: Zhao, Jun (1); Xiang, Xinran (1); Zhao, Jinzhou (1); Li, Haitao (1); Guo, Ping (1); Zhang, Liehui (1); Zhou, Shouwei (1); Wei, Na (1); Li, Qingping (2); Pang, Weixin (2)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) CNOOC Research Institute Co., Ltd., Beijing; 100027, China

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Document type: Journal article (JA)

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Abstract: Gas hydrate (hereinafter, "hydrate" for short) in the marine environment mostly lies in weakly consolidated sediments, so its undisturbed coring is difficult and costly. In view of this, it is necessary to understand the relationship between acoustic properties and elastic mechanical properties of hydrates through laboratory experiments. In this paper, samples of hydrate sediments were prepared indoors. Then, petrophysical experiments were carried out on these samples to measure the electric parameters and acoustic parameters of hydrate sediments. Finally, according to the theory of elasticity, the dynamic elastic mechanical parameters under three axial compressions, three particle sizes and three shale contents were calculated to analyze their effects on the dynamic elastic mechanical parameters of hydrate sediments under different conditions. And the following research results were obtained. First, when the hydrate saturation is in a certain range, it is in a proportional relationship with the elastic parameters of sediments. Second, when the hydrate saturation is constant, the dynamic Young's modulus of hydrate sediments increases, but the Poisson's ratio has little to do with the axial compression as particle sizes (0.125-1.180 mm) and axial compression increase and shale content decreases. Third, a model of the relationship between the elastic parameters and the shale content and axial compression is established. In conclusion, the dynamic elastic mechanical indexes of gas hydrate obtained from the acoustic logging methodology will solve the above difficulties and the research results provide a reference for calculating the mechanical properties of hydrate sediments by use of logging data. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 12

Main heading: Gas hydrates

Controlled terms: Acoustic logging - Acoustic properties - Axial compression - Dynamics - Elastic moduli - Elasticity - Hydration - Particle size - Particle size analysis - Petrophysics - Sediments - Shale

Uncontrolled terms: Dynamic young's modulus - Elastic mechanical properties - Experimental analysis -

Laboratory experiments - Mechanical parameters - Petrophysical - Proportional relationships - Well logging data

Classification code: 483 Soil Mechanics and Foundations - 522 Gas Fuels - 751.2 Acoustic Properties of Materials - 951 Materials Science

Numerical data indexing: Size 1.25e-04m to 1.18e-03m
DOI: 10.3787/j.issn.1000-0976.2018.12.005
Compendex references: YES
Database: Compendex
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Data Provider: Engineering Village

97. Effect evaluation of hammer-milling thermal desorption technology on oil-based drilling fluid cuttings

Accession number: 20185006230377

Title of translation:

Authors: Huang, Zhiqiang (1, 2); Xu, Ziyang (1); Quan, Yinhu (3); Li, Qianchun (3); Zhang, Xinfu (3); Guo, Liang (3); Chen, Zhen (1, 2); Li, Jianan (2)

Author affiliation: (1) School of Mechanical Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) MOE Key Laboratory of Oil and Gas Equipment, Chengdu; Sichuan; 610500, China; (3) Drilling & Production Technology Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Xi'an; Shaanxi; 710018, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 83-90

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The oily cuttings of oil based drilling fluid in shale gas drilling can be hardly treated. And hammer-milling thermal desorption is a new environmental protection technology to solve this difficulty. In China, however, the research on this technology began later and there are no effective means and methods to evaluate its performance. In this paper, an evaluation system to evaluate the oily cuttings processing performance of hammer-milling thermal desorption was established with processing effect, energy consumption and processing capacity as evaluation indicators. Then, a hammer-milling thermal desorption station for processing oily cuttings was built up at one drilling platform in Changning-Weiyuan National Shale Gas Demonstration Area, Sichuan Basin. Finally, a hammer-milling thermal desorption test was conducted on oily cuttings, a system energy balance equation was established to evaluate energy consumption and the processing capacity was assessed by means of orthogonal test. Thus, a set of method for evaluating the oily cuttings processing performance of hammer-milling thermal desorption was developed. And the following research results were obtained. First, the evaluation system criterion on the oily cuttings processing performance of hammer-milling thermal desorption is as follows. The oil content of solid residual after processing is less than 1%, the solid content of recovered oil is lower than 0.3%, the thermal efficiency of the system is 88%, higher than the energy saving evaluation index, the thermal utilization is higher than 95% and the unitpower processing capacity of hammer-milling thermal desorption device is higher than $4.23 \times 10^{-3} \text{ t}/(\text{h} \cdot \text{kW})$. Second, under the optimum condition of operating temperature of 310 and processing time of 10 min, the oil content of solid residual after processing is 0.88% and the solid content of recovered oil is 0.28%. And it is indicated that the processing performance meets the environmental protection standards. Third, the thermal efficiency of hammer-milling thermal desorption technology reaches 93.39% and its thermal utilization is up to 98.82%, which means that this technology is not only high in oily cuttings processing efficiency, but also remarkable in energy saving and cost reducing. Fourth, preprocessing oily cuttings to reduce the moisture content of the drill cuttings can improve the processing capacity significantly, while preheating oily cuttings cannot improve it well. It is concluded that the research results can provide reference for improving the oily cuttings processing performance of hammer-milling thermal desorption. Besides, the oil-based drilling fluid that is made of recovered oil satisfies the requirements of on-site drilling, and thus the effective reutilization of oil resources is realized. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 25

Main heading: Oil shale processing

Controlled terms: Drilling fluids - Energy efficiency - Energy utilization - Environmental protection - Environmental technology - Hammers - Infill drilling - Milling (machining) - Recovery - Shale gas - Thermal desorption

Uncontrolled terms: Oil-based drilling fluid - Performance evaluation method - Processing capacities - Processing performance - Re-utilization

Classification code: 454 Environmental Engineering - 454.2 Environmental Impact and Protection - 511.1 Oil Field Production Operations - 513.1 Petroleum Refining, General - 522 Gas Fuels - 525.2 Energy Conservation - 525.3 Energy Utilization - 604.2 Machining Operations - 605.2 Small Tools, Unpowered

Numerical data indexing: Percentage 1.00e+00%, Percentage 2.80e-01%, Percentage 3.00e-01%, Percentage 8.80e+01%, Percentage 8.80e-01%, Percentage 9.34e+01%, Percentage 9.50e+01%, Percentage 9.88e+01%, Time 6.00e+02s

DOI: 10.3787/j.issn.1000-0976.2018.08.012

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

98. Technologies for the benefit development of low-permeability tight sandstone gas reservoirs in the Yan'an Gas Field, Ordos Basin

Accession number: 20191006600868

Title of translation:

Authors: Wang, Xiangzeng (1); Qiao, Xiangyang (2); Mi, Naizhe (2); Wang, Ruogu (2)

Author affiliation: (1) Shaanxi Yanchang Petroleum Co., Ltd., Xi'an; Shaanxi; 710075, China; (2) Research Institute, Shaanxi Yanchang Petroleum Co., Ltd., Xi'an; Shaanxi; 710075, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Yan'an Gas Field is located in the southeastern part of the Ordos Basin, and its low-permeability tight sandstone gas reservoirs are characterized by thin reservoirs, poor physical properties and complex overlapping relationships. In addition, its surface is loess tableland, which makes it difficult to predict reservoirs by using seismic data. As a result, existing engineering technologies for gas field development cannot support the efficient development of this field. In order to optimize the development methods and technologies of the Yan'an Gas Field, the Yanchang Petroleum (Group) Co. Ltd. has developed to a set of key technologies suitable for the benefit development of this field concerning reservoir prediction, well pattern optimization, drilling and completion, reservoir protection, fracturing stimulation and ground gathering and transportation after nearly ten years of theoretical and technical researches. First, an effective reservoir prediction technology based on dynamic knowledge base was developed. It improves the drilling ratio of effective sandbody dramatically and achieves the accurate tracking of stable single sandbody in the range of 3-5 m. Second, a three-dimensional exploitation mode of mixed well pattern based on the irregular diamond-shaped well pattern was established. It includes the multi-layer commingled production of cluster well and the single-layer production of horizontal well. Compared with regular well patterns, the well number is reduced by 6.9% and well pattern control is increased by 8%. Third, high-efficiency drilling technology for vulnerable reservoirs with collapse and leakage in the same well was developed. It improves wellbore wall stability, shortens drilling cycle and protects reservoir. Fourth, the multi-layer long-span fracturing of vertical/directional wells in one operation and the CO₂ and hydraulic fracturing treatment of horizontal wells were realized to improve single well production significantly. Fifth, the medium-pressure gathering and transportation system in loess tableland with downhole throttling, branch-on-branch inter-well tandem and centralized alcohol injection as the core technologies was established. It reduces workload, shortens construction cycle and improves economic benefit. In conclusion, these development technologies play a crucial role in the development, appraisal and productivity construction of the Yan'an Gas Field. Through the application of these key technologies, the benefit development of this field is realized with an annual natural gas production capacity of 50×10⁸ m³. Furthermore, they are conducive to the enrichment and development of the theories and technologies for developing tight sandstone gas reservoirs in China, and they can be used as a reference for the development of similar gas fields. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 27

Main heading: Low permeability reservoirs

Controlled terms: Forecasting - Fracture - Gas industry - Gas permeability - Gases - Horizontal wells - Infill drilling - Knowledge based systems - Metamorphic rocks - Natural gas - Natural gas fields - Natural gas well completion - Natural gas well production - Oil field development - Oil well drilling - Oil wells - Petroleum reservoir engineering - Petroleum transportation - Reservoirs (water) - Sandstone - Sediments - Seismology - Tight gas - Well stimulation

Uncontrolled terms: Benefit development - Gas fields - Low damages - Ordos Basin - Tight sandstone gas - Well patterns

Classification code: 441.2 Reservoirs - 482.2 Minerals - 483 Soil Mechanics and Foundations - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 723.4.1 Expert Systems - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 6.90e+00%, Percentage 8.00e+00%, Size 3.00e+00m to 5.00e+00m

DOI: 10.3787/j.issn.1000-0976.2018.11.005

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

99. Structural design of extended reach horizontal wells in pressure depleted gas reservoirs based on the leakage pressure limit method

Accession number: 20185006230378

Title of translation:

Authors: Li, Zhonghui (1); Li, Zhong (2); Fang, Manzong (2); Lou, Yishan (1); Chen, Haodong (2); Liu, Jie (3)

Author affiliation: (1) National Engineering Laboratory for Oil and Gas Drilling Technology, School of Petroleum Engineering, Yangtze University, Wuhan; Hubei; 430100, China; (2) CNOOC China Limited Zhanjiang Branch, Zhanjiang; Guangdong; 524057, China; (3) Turpan Oil Production Plant, PetroChina Tuha Oilfield Company, Turpan; Xinjiang; 838000, China

Corresponding author: Li, Zhong(lizhong@cnooc.com.cn)

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Abstract: The rock characteristic parameters and earth stress of pressure depleted gas reservoirs are changed after the oil/gas pressure drops, so the casing program used for undepleted reservoirs is not suitable any longer and it tends to bring about complex downhole situations, e.g. circulation loss and well collapse. In this paper, the difficulties and countermeasures of extended reach horizontal wells in pressure depleted reservoirs were analyzed. Then, a method to design the casing program of horizontal well in pressure depleted reservoirs was developed with the balance between the maximum wellbore fluid column pressure and the leakage pressure as the constraint to determine the casing running depth while considering the effect of equivalent circulation density (ECD). Finally, this design method was applied on site in the Dongfang 1-1 Gas Field, Yinggehai Basin. And the following research results were obtained. First, the leakage pressure is taken as the upper limit of borehole balance pressure, which is equal to the minimum horizontal major earth stress. Second, the minimum horizontal major earth stress decreases with the drop of the fluid pressure in the producing zones of gas reservoirs. Third, the casing running depth limit is controlled by the ECD of drilling fluid. That is to say the annulus pressure loss will increase to the depth of critical leakage point as the horizontal section extends. Fourth, the pressure of the principal reservoir in the Dongfang 1-1 Gas Field is depleted seriously. And its optimized casing program is four-spudding structure, in which the reservoirs of 3 different pressure systems are not arranged in the same open hole section and the occurrence probability of complex downhole situations is reduced effectively. In conclusion, this method provides a theoretical basis for the design of casing program of extended reach horizontal wells in pressure depleted reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Horizontal wells

Controlled terms: Boreholes - Drilling fluids - Drops - Gas industry - Gases - Oil wells - Petroleum reservoirs - Structural design

Uncontrolled terms: Casing program - Equivalent circulation density - Extended reach well - Gas fields - Gas reservoir - Leakage pressure - Pressure depletion - Yinggehai basin

Classification code: 408.1 Structural Design, General - 512.1.1 Oil Fields - 522 Gas Fuels

DOI: 10.3787/j.issn.1000-0976.2018.08.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

100. Geological characteristics and enrichment laws of normal-pressure shale gas in the basin-margin transition zone of SE Chongqing

Accession number: 20191306691377

Title of translation:

Authors: He, Xipeng (1); He, Guisong (1); Gao, Yuqiao (1); Zhang, Peixian (1); Lu, Shuangfang (2); Wan, Jingya (1)

Author affiliation: (1) Research Institute of Exploration and Development, Sinopec East China Oil & Gas Company, Nanjing; Jiangsu; 210011, China; (2) Research Institute of Unconventional Oil & Gas and New Energy, China University of Petroleum, Qingdao; Shandong; 265580, 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: The southeastern Sichuan Basin and its basin-margin transition zone (hereinafter referred to as the basin-margin transition zone of SE Chongqing) is the focus of normal-pressure shale gas exploration in China. In order to summarize the geological characteristics and enrichment laws of shale gas in the basin-margin transition zone of SE Chongqing, we analyzed the geological characteristics of shale gas reservoirs in the Nanchuan-Wulong area of this transition zone from the aspects of sedimentary formation, tectonic reworking and production characteristics by using geophysical, drilling, logging and testing data, and then we compared it the overpressure shale gas reservoirs in Jiaoshiha Block. Finally, we explored the main factors controlling the enrichment & high yields of normal-pressure shale gas in this transition zone and their hydrocarbon accumulation patterns. And the following research results were obtained. (1) Different from the overpressure shale gas reservoirs in Jiaoshiha Block, the normal-pressure shale gas reservoirs in this transition zone are characterized by lower organic porosities, more developed micro-fractures, higher ratios of adsorbed gas, greater differences of stresses in two directions, lower geothermal gradients, lower formation pressure coefficients, higher initial fluid production rates and higher fluid flowback rates. (2) The enrichment & high yields of normal-pressure shale gas in this area is mainly controlled by three factors, i.e., carbon-rich, silicate-rich and grapholite-rich shale, organic pores, and tectonic stress field, among which, the first factor controlled by deepwater continental shelf facies is the basis of shale gas enrichment, the second is the main controlling factor of shale gas enrichment, and the third is the key factor of high-yield shale gas. (3) The hydrocarbon accumulation patterns of normal-pressure shale gas reservoirs in the transition zone can be divided into four types, including the anticline type, the syncline type, the slope type and the reverse fault type. And the enrichment & high-yield characteristics of shale gas in different hydrocarbon accumulation patterns are also clarified. In conclusion, the research results enrich the geological theory of enrichment & high-yield laws of normal-pressure shale gas and provide a support for the exploration and development of normal-pressure shale gas in complex structures. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 26

Main heading: Petroleum prospecting

Controlled terms: Bacteriology - Faulting - Gases - Geological surveys - Hydrocarbons - Offshore gas fields - Petroleum reservoirs - Shale gas - Silicates - Stresses

Uncontrolled terms: Gas accumulation - High yield - Normal pressure - Sichuan Basin - Silurian - Tectonic stress fields - Transition zones

Classification code: 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 512 Petroleum and Related Deposits - 522 Gas Fuels - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2018.12.001
Compendex references: YES
Database: Compendex
Compilation and indexing terms, Copyright 2019 Elsevier Inc.
Data Provider: Engineering Village

101. Mechanism of fracture damage induced by fracturing fluid flowback in shale gas reservoirs

Accession number: 20191306691383

Title of translation:

Authors: You, Lijun (1); Xie, Benbin (1); Yang, Jian (2); Kang, Yili (1); Han, Huifen (2); Wang, Liang (2); Yang, Bin (1)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Engineering and Technology Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610017, China

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Abstract: In this paper, the Lower Silurian Longmaxi shale samples and the backflow fracking fluid in the Changning Block of the Sichuan Basin were selected to investigate the damage mechanism of retained fracking fluid to fractures in shale gas reservoirs. Thus, experiments were conducted on fracking fluid backflow and gas-driving fracking fluids. The changes of liquid permeability of shale samples, solid particle size distribution and turbidity of the backflow fracking fluid were monitored. The gas permeability before and after fracking fluid gas drive was compared, and the damage degree and mechanism of the backflow fracking fluid to the fractures in shale samples were analyzed. And the following research results were obtained. First, the damage rate of shale permeability after the fracking fluid backflow is between 53.1% and 97.6%, and the range of the solid particle size of the flowback fluid is significantly reduced. The main reservoir damage modes include phase trapping damage caused by liquid phase retention, blockage caused by the solid phase residue, particle migration induced by gas-carrying liquid and salt precipitation. Second, in the stage of gas phase flow, the damage rate of permeability drops to 23.1-80.2%, and the damage caused by liquid phase retention is relieved, but the damage caused by the blockage of solid phase residue and the salt precipitation of flowback on the fracture surface is inevitable. Third, based on the damage mechanism of fracking fluid backflow in shale gas wells to fractures, considering the treatment difficulty of the flowback and its damage to reservoir fractures, it is recommended to give a full play to the fracturing capacity of fracking fluid and optimize the properties and dosages of fracking fluid so as to reduce the flowback of fracking fluid as much as possible. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 50

Main heading: Hydraulic fracturing

Controlled terms: Fracturing fluids - Gas permeability - Gases - Liquids - Particle size - Particle size analysis - Petroleum reservoirs - Precipitation (chemical) - Shale gas

Uncontrolled terms: Changning Block - Flowback - Particle migration - Reservoir damage - Salt precipitation - Sichuan Basin - Silurian - Solid-phase - Water phase

Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 802.3 Chemical Operations - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 2.31e+01% to 8.02e+01%, Percentage 5.31e+01% to 9.76e+01%

DOI: 10.3787/j.issn.1000-0976.2018.12.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

102. Significance of paleo-fluid in the Ordovician–Silurian detachment zone to the preservation of shale gas in western Hunan–Hubei area

Accession number: 20183905863712

Authors: Liu, An (1); Ou, Wenjia (2); Huang, Huilan (1); Wei, Kai (1); Li, Hai (1); Chen, Xiaohong (1)

Author affiliation: (1) Wuhan Centre of Geology Survey, China Geological Survey, Wuhan; Hubei; 430205, China; (2) China University of Geosciences, Wuhan; Hubei; 430074, China

Corresponding author: Ou, Wenjia(wenjiaou1985@163.com)

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The studies on the paleo-fluid in the Ordovician–Silurian detachment zone in the Middle–Upper Yangtze area focus on the origin of high-density methane inclusions and the evolution process of formation pressure, but rarely deal with the significance of paleo-fluid to shale gas preservation. In this paper, the relationship between fracture formation and detachment zone was analyzed by observing the Ordovician–Silurian outcrops in western Hunan–Hubei area and by investigating the geological characteristics of fracture veins in the drilling cores. Then, the significance of paleo-fluid forming environment and detachment zone to shale gas preservation was studied by using inclusion compositions of fracture veins and homogenization temperature test data. Finally, accumulation-dispersion modes of shale gas in the detachment zone were established. The following results were obtained. First, the detachment zone is lithologically composed of silicate with intercalated shale at the Ordovician–Silurian interface. In the detachment zone, rocks are broken and small crumples are developed. The conjugate-vertical joints are relatively developed in the silicate above and below the detachment zone. Second, multistage and multi-type inclusions, especially the aqueous inclusions, are developed in the veins of the detachment zone. Third, the infiltration depth of ancient meteoric water along the detachment zone in the study area is over 4 000 m. High-density overpressure methane inclusions were captured in the detachment zone in the early stage, while normal-pressure methane and nitrogen inclusions were captured in the late stage. Fourth, the ionic constituents of inclusions recording the fluid activity in the late stage was characterized by high sodium chloride coefficient, high desulfurization coefficient and low metamorphic coefficient, and it is indicated that the sealing capacity of the shale in the detachment zone gets worse. And fifth, the accumulation and dispersion of shale gas in the detachment zone within the study area is divided into three modes, i.e., syncline, broad anticline and closed anticline. In conclusion, the detachment zone in the study area is permeable. Synclines and closed anticlines developed in detachment structures are unfavorable for the accumulation of shale gas, while broad anticlines are favorable. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 34

Main heading: Shale gas

Controlled terms: Dispersions - Fracture - Gases - Inclusions - Methane - Silicates - Sodium chloride

Uncontrolled terms: Homogenization temperatures - Ionic constituent - Ordovician - Preservation condition - Silurian

Classification code: 522 Gas Fuels - 804.1 Organic Compounds - 951 Materials Science

Numerical data indexing: Size 4.00e+03m

DOI: 10.3787/j.issn.1000-0976.2018.05.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

103. Dynamic characteristics and numerical optimization of non-fixed connecting compressor foundation

Accession number: 20182905565480

Authors: Liu, Xiaojun (1); Kong, Qing (1); Xu, Binbin (1); Zheng, Yana (2)

Author affiliation: (1) College of Civil Engineering, Xi'an University of Architecture and Technology, Xi'an; Shaanxi; 710055, China; (2) Xi'an Changqing Technology Engineering Co., Ltd., Xi'an; Shaanxi; 710018, China

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Publication year: 2018

Pages: 123-129

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The rational design of compressor foundation can help reduce the vibration effect of the compressor, and it plays an important role in ensuring the smooth operation of the compressor and the normal transmission of natural gas. In this paper, the dynamic features of non-fixed connecting compressor foundation under a dynamic force were investigated through field tests on the actual project. Then, the finite element model for non-fixed connecting compressor foundation was established by using ANSYS 15.0, and was then verified. Finally, the bearing capacity of the foundation and the cushion thickness were optimized in this model. The following research results were obtained. First, the sand-gravel cushion between the skid base of the compressor and the foundation has a good damping effect and its dynamic action is weakened with the increase of the installation depth. Second, the displacement response and stress response of the compressor calculated by performing numerical simulation on non-fixed connecting compressor foundation in the finite element model are better consistent with the data of in-situ dynamic tests and field pressure tests. It is indicated that this model is rational. Third, when the excitation frequency of the compressor is 7.3 Hz, the natural frequency of the foundation is minimum (5.0 Hz) while its bearing capacity is 80 kPa, the self-vertical displacement of the foundation is minimum (0.092 mm) while its bearing capacity is 100 kPa, and the optimized bearing capacity is 120 kPa. Fourth, the natural frequency of the compressor increases and then decreases with the increase of cushion thickness, and the natural frequency is 6.3 Hz when the cushion is 200 mm and 400 mm thick. To guarantee the damping effect of the cushion, it is recommended to set the cushion thickness at 400 mm. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Compressors

Controlled terms: Bearing capacity - Damping - Finite element method - Foundations - Natural frequencies - Optimization

Uncontrolled terms: Cushion thickness - Damping effect - Dynamic features - Numerical - On-site tests

Classification code: 483.2 Foundations - 618.1 Compressors - 921.5 Optimization Techniques - 921.6 Numerical Methods - 931.1 Mechanics

Numerical data indexing: Frequency 5.00e+00Hz, Frequency 6.30e+00Hz, Frequency 7.30e+00Hz, Pressure 1.00e+05Pa, Pressure 1.20e+05Pa, Pressure 8.00e+04Pa, Size 2.00e-01m, Size 4.00e-01m, Size 9.20e-05m

DOI: 10.3787/j.issn.1000-0976.2018.01.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

104. The Permian source rocks in the Sichuan Basin and its natural gas exploration potential (Part 1): Spatial distribution of source rocks

Accession number: 20183905863709

Authors: Chen, Jianping (1, 2, 3); Li, Wei (1, 2); Ni, Yunyan (1, 2, 3); Liang, Digang (1, 2, 3); Deng, Chunping (1, 2, 3); Bian, Lizeng (4)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) State Key Laboratory of Enhanced Oil Recovery, Beijing; 100083, China; (3) CNPC Key Laboratory of Petroleum Geochemistry, Beijing; 100083, China; (4) School of earth Sciences and Engineering, Nanjing University, Nanjing; Jiangsu; 210093, China

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Publication year: 2018

Pages: 1-16

Language: Chinese

ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Permian-Middle-Lower Triassic strata belong to the major gas payzones in the Sichuan Basin. Natural gas in many large and medium-sized gas fields discovered is derived from the Permian source rocks, but the main types and spatial distribution of which, so far, however, have not been understood systematically and completely. In this paper, fine geochemical calibration was conducted on the horizons of Permian source rocks in typical wells/sections of the Sichuan Basin. Then, the types and spatial distribution of the Permian source rocks were analyzed using well drilling and logging data. The following results were obtained. First, in the Sichuan Basin, two sets of source rocks (i.e., the Middle Permian carbonate rocks and the Upper Permian mudstone rocks) are developed in the Permian, and the Upper Permian Dalong Fm marine mudstone source rocks are locally developed. Second, the mudstone source rocks of Longtan Fm, Upper Permian, are characterized by large thickness, high organic matter abundance and wide distribution in the whole basin, and it is the most important set of source rocks in the Permian. The Longtan Fm mudstone source rocks are 80-140 m thick in the Cangxi-Yunyang area in the northern Sichuan Basin, 60-100 m thick in the Chengdu-Chongqing-Luzhou area in the southern Sichuan Basin, and 40-80 m thick in central Sichuan Basin. Third, the Longtan Fm coal is also an important source rock in the Sichuan Basin. It is 5-15 m thick in the Nanchong-Qijiang-Luzhou area in the central-SE Sichuan Basin and 2-5 m thick in the NE Sichuan Basin. Fourth, the Upper Permian Changxing Fm source rocks are poorly developed, while the Dalong Fm source rocks are distributed with a thickness of 5-25 m in the Kaijiang-Guangyuan area in the northern Sichuan Basin, acting as important source rocks in the northern Sichuan Basin. Fifth, the Middle Permian carbonate source rocks are widely distributed in the whole Sichuan Basin, acting as secondary source rocks in the Permian, and their thickness is 50-150 m in the NE and SE Sichuan Basin and generally less than 50 m in other areas. © 2018, Natural Gas Industry Journal Agency. All rights reserved.

Number of references: 49

Main heading: Spatial distribution

Controlled terms: Carbonates - Carbonation - Coal - Exploratory geochemistry - Gas industry - Natural gas - Natural gas fields - Petroleum prospecting - Sedimentary rocks - Well drilling

Uncontrolled terms: Carbonate rock - Mudstone - Permian - Sichuan Basin - Source rocks

Classification code: 481.2 Geochemistry - 482.2 Minerals - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 524 Solid Fuels - 802.2 Chemical Reactions - 804.2 Inorganic Compounds - 921 Mathematics

Numerical data indexing: Size 2.00e+00m to 5.00e+00m, Size 4.00e+01m to 8.00e+01m, Size 5.00e+00m to 1.50e+01m, Size 5.00e+00m to 2.50e+01m, Size 5.00e+01m to 1.50e+02m, Size 5.00e+01m, Size 6.00e+01m to 1.00e+02m, Size 8.00e+01m to 1.40e+02m

DOI: 10.3787/j.issn.1000-0976.2018.05.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

105. Response laws of pressure relief devices with different structures on the cylinder of CNG long tube trailer in fire environments

Accession number: 20183905863724

Authors: Zhao, Baodi (1); Bo, Ke (1); Luo, Hui (1); Deng, Guide (1); Liu, Cenfan (1); Jin, Mingzhe (1); Jing, Bo (1)

Author affiliation: (1) China Special Equipment Inspection and Research Institute, Beijing; 100029, China

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Publication year: 2018

Pages: 133-139

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Natural gas is susceptible to leakage and explosion during storage and transmission. Any of such incidents may induce great personal and physical losses. Therefore, installation of pressure relief devices is mandatory under relevant industry standards and codes to ensure the safe pressure release of CNG cylinders under over-temperature and over-pressure conditions, so as to reduce the accident risks. However, the calculation methods and formulas for the design of pressure relief devices under such standards and codes are different, so the pressure relief devices provide different responses under fire conditions. In this paper, the case that a large-capacity seamless steel cylinder is totally in fire was analyzed to figure out the temperature and pressure changes of the CNG cylinder on the trailer and the responses of pressure relief devices with different structural styles. The following results were obtained. First, the pressure relief devices designed according to API 521-2014, CGA S-1.1 and GB 16918-1997 can satisfy the requirements on safe pressure release of large-capacity seamless steel cylinder. Considering that CNG may induce secondary damage, it is recommended to calculate the minimum relief area according to API 521-2014 or CGA S-1.1. Second, when the flame is isolated by the steel plates, the heat conduction of pressure relief devices is hindered and a single bursting disc structure usually responds earlier than a composite structure of bursting disc and fusible alloy. Third, when a large-capacity seamless steel cylinder is in fire, the change of gas temperature is much more affected by the relief area after the pressure relief device is started. In conclusion, the research results provide a technical support for the standard preparation and type selection of pressure relief devices on the CNG tube trailers. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16**Main heading:** Structural design**Controlled terms:** Codes (standards) - Cylinders (shapes) - Design - Fires - Heat conduction**Uncontrolled terms:** Fire tests - Foreign standards - Pressure relief devices - Relief area - Responses - Seamless steel cylinders**Classification code:** 408.1 Structural Design, General - 641.2 Heat Transfer - 902.2 Codes and Standards - 914.2 Fires and Fire Protection**DOI:** 10.3787/j.issn.1000-0976.2018.05.016**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

106. Small-spacing twin well natural solution and communication technology for solution mining of salt cavern underground gas storages

Accession number: 20183805830750**Authors:** Zheng, Yali (1, 2); Lai, Xin (1, 2); Qiu, Xiaosong (1, 2); Zhao, Yanjie (1, 2); Wanyan, Qiqi (1, 2); Qu, Dan'an (3)**Author affiliation:** (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) CNPC Key Laboratory of Oil & Gas Underground Storage Engineering, Langfang; Hebei; 065007, China; (3) PetroChina East Pipeline Co., Ltd., Shanghai; 200122, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 3**Issue date:** March 25, 2018**Publication year:** 2018**Pages:** 96-102**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Single-well solution mining of salt cavern underground gas storages suffers from low construction speeds and long construction periods. In view of this, the brine extraction technologies applied in salt mines were investigated in this paper. Then, referring to the technical ideas of pair-well solution mining in salt mines, a solution mining idea of "single-well sump building, natural solution and communication, and cavern construction by twin-well convection" was proposed for salt cavern gas storages. Based on a physical simulation experiment of laboratory pair-well brine extraction, the communication mode and well spacing of twin-well solution mining were experimentally

simulated to analyze the feasibility of natural solution and communication technology based on the small-spacing twin well for solution mining and to predict its solution mining results. The small-spacing twin well natural solution and communication process for solution mining of salt cavern gas storages was built, and field pilot tests and acoustic detection were carried out. And the following research results were obtained. First, the cavern construction speed increases by using the twin well, and the resulted cavern construction speed in the experiment increases by 1.7 times. Second, to build regular and detectable salt caverns, it is advisable to adopt the solution mining technology of small-spacing natural solution and communication. Third, it is indicated from the simulation prediction plan of building a single cavern with an effective volume of $30 \times 10^4 \text{ m}^3$ that compared with single-well solution mining, twin-well solution mining is 25% shorter in construction period (about 1 year) and 55% less in energy consumption. It is concluded that twin-well solution mining plays a remarkable role in accelerating cavern construction and reducing energy consumption, so it is necessary to speed up its research and field tests so as to realize its popularization and application as soon as possible. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 22

Main heading: Solution mining

Controlled terms: Caves - Computer aided software engineering - Construction - Energy utilization - Extraction - Natural gas fields - Natural gas wells - Salt deposits - Salt mines - Speed - Underground gas storage - Well spacing

Uncontrolled terms: Construction period - Construction speed - Mining technology - Salt caverns - Twin well with small spacing

Classification code: 405 Construction Equipment and Methods; Surveying - 481.1 Geology - 502.1 Mine and Quarry Operations - 505.1 Nonmetallic Mines - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 525.3 Energy Utilization - 723.1 Computer Programming - 802.3 Chemical Operations

Numerical data indexing: Age 1.00×10^0 yr, Percentage $2.50 \times 10^1\%$, Percentage $5.50 \times 10^1\%$

DOI: 10.3787/j.issn.1000-0976.2018.03.012

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107. Influence of sloshing on the performance of trough plate redistributor

Accession number: 20183905879916

Authors: Tang, Jianfeng (1, 2); Cui, Jian (1, 3); Xing, Qingyan (1); Zhang, Weiming (1); Jin, Xinming (1); Ma, Pengfei (1)

Author affiliation: (1) College of Pipeline and Civil Engineering, China University of Petroleum - Huadong, Qingdao; Shandong; 266580, China; (2) Shandong Key Laboratory of Oil and Gas Storage and Transportation Technology, China University of Petroleum - Huadong, Qingdao; Shandong; 266580, China; (3) Shandong Company of Evergrande Group, Zibo; Shandong; 255000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: A packed tower is one of the components of deepsea floating natural gas production, storage and unloading devices. In order to ensure the good redistribution performance of a gas-liquid redistributor in the packed tower, we developed a set of experimental devices which can realize different sloshing conditions and different bias current incoming forms and a corresponding numerical calculation model by combining hydraulics experiments with hydromechanics numerical simulation. Then, the simulation results were verified by using the experimental results, and simulation results and experimental results were analyzed. Finally, the performance of the traditional trough plate redistributor was investigated in the working conditions of quiescence, sloshing and different bias current incoming. And the following research results were obtained. First, in the working condition of quiescence, the liquid flow rate of different sprinkling points on the traditional trough plate redistributor is basically the same and the uniform distribution is presented with the non-uniformity in the order of 10–2. Second, the reason for the uniform redistribution deterioration of the redistributor is mainly the liquid level difference caused by the liquid migration. Third, in the working conditions

of quiescence, rolling and pitching, the uniform distribution of trough plate distributor is rarely affected by the change of bias current degree of the incoming liquid. In the working condition of sloshing 5°, the non-uniformity difference of the overall orifice flow rate between the liquid incoming in the whole area and that in 2/3 area is less than 5%. Fourth, the non-uniformity of the overall orifice flow rate in the trough plate redistributor is more affected by rolling and pitching. The non-uniformity of the overall orifice flow rate rises to over 0.5 in the working condition of rolling 5° and over 0.3 in pitching 5°. It is indicated that in the working condition of sloshing 5°, the uniform distribution of trough plate distributor is poor not only in the case of whole area liquid incoming but also in the case of bias current incoming, and it is affected more by sea conditions. In conclusion, the traditional trough plate redistributor is poorly adaptive to the sloshing at sea. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Liquid sloshing

Controlled terms: Bias currents - Computer simulation - Deterioration - Drop breakup - Floating liquefied natural gas - Flow rate - Natural gas - Natural gas well production - Numerical models - Orifices - Rolling - Unloading

Uncontrolled terms: Experimental devices - Natural-gas production - Non-uniformities - Numerical calculation model - Packed tower - Pitching - Trough plate redistributor - Uniform distribution

Classification code: 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631 Fluid Flow - 631.1 Fluid Flow, General - 691.2 Materials Handling Methods - 701.1 Electricity: Basic Concepts and Phenomena - 723.5 Computer Applications - 921 Mathematics - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 5.00e+00%

DOI: 10.3787/j.issn.1000-0976.2018.06.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

108. An electrochemical adsorption method for the reuse of waste water-based drilling fluids

Accession number: 20183805830747

Authors: Xie, Shuixiang (1); Ren, Wen (1); Qiao, Chuan (2); Tong, Kun (1); Sun, Jingwen (1); Zhang, Mingdong (1); Liu, Xiaohui (1); Zhang, Zhena (1)

Author affiliation: (1) State Key Laboratory of Petroleum Pollution Control//CNPC Research Institute of Safety and Environment Technology, Beijing; 102206, China; (2) Shunan Division, PetroChina Southwest Oil & Gasfield Company, Luzhou; Sichuan; 646001, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Publication year: 2018

Pages: 76-80

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 17

Main heading: Drilling fluids

Controlled terms: Adsorption - Bentonite - Electrodes - Infill drilling - Nanoparticles - Particle size - Potassium compounds - Sodium chloride - Waste treatment - Wastewater reclamation - Wastewater treatment - Water conservation

Uncontrolled terms: Electrochemical adsorption - Reclamation and reuse - Removal rate - Resource utilization ratios - Water based drilling fluids

Classification code: 444 Water Resources - 452.4 Industrial Wastes Treatment and Disposal - 482.2 Minerals - 511.1 Oil Field Production Operations - 761 Nanotechnology - 802.3 Chemical Operations - 933 Solid State Physics

Numerical data indexing: Mass_Density 2.00e+00kg/m³, Percentage 5.00e+00%, Percentage 9.00e+01%, Size 5.00e-02m, Time 3.00e+02s, Voltage 3.60e+01V

DOI: 10.3787/j.issn.1000-0976.2018.03.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

109. Geological conditions for massive accumulation of natural gas in the Mid-Permian Maokou Fm of the Sichuan Basin

Accession number: 20182905565468

Authors: Wang, Zecheng (1); Jiang, Qingchun (1); Huang, Shipeng (1); Zhou, Hui (1); Feng, Qingfu (1); Dai, Xiaofeng (1); Lu, Weihua (1); Ren, Mengyi (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.

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Issue date: January 25, 2018

Publication year: 2018

Pages: 30-38

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the past few years, a number of high-productivity gas wells were drilled in the Mid-Permian Maokou Fm in the northwestern and central parts of the Sichuan Basin. This set of strata appears to have bright prospects in natural gas exploration. To determine if it has necessary geological conditions for the massive accumulation of natural gas, we conducted a study in three aspects, i.e. conditions of hydrocarbon source rocks, distribution of grain beaches, and distribution and origin of weathered crust karst reservoirs. The following findings were obtained. First, the Maokou Fm gentle-slope grain beaches are distributed extensively in the areas to the west of Guangyuan-Guang'an-Chongqing, laying a reliable geological foundation for the formation of reservoirs. Second, the global sea-level fall led to the formation of regional erosion surfaces, which eventually promoted the formation of massive karst reservoirs. Third, three major sets of hydrocarbon source rocks (Lower Silurian Longmaxi Fm, Mao-1-Mao-2c, and Upper Permian Longtan Fm) and the weathered crust karst reservoir of Maokou Fm formed a "sandwich-type" source-reservoir assemblage, which is the key to the massive accumulation of natural gas. On this basis, the gas enrichment conditions in the Maokou Fm were analyzed, and favorable exploration orientation and targets were proposed. In conclusion, the Maokou Fm in the basin has necessary geological conditions for the massive accumulation of natural gas. Besides, the erosion palaeogeomorphology and later strike-slip faults reworked and controlled the distribution of large fractures and cavities in the study area, and the combination of grain beaches, weathered crust karsts, and strike-slip faults controlled the favorable zones for the enrichment and high-productivity of natural gas. Moreover, the Gaoshiti-Moxi area in the central Sichuan Basin, where strike-slip faults are developed and there are favorable gas accumulation conditions in the Maokou Fm, is an ideal option for scale natural gas exploration. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 31

Main heading: Petroleum prospecting

Controlled terms: Beaches - Erosion - Fault slips - Gases - Geological surveys - Hydrocarbons - Natural gas - Natural gas well production - Offshore gas fields - Offshore gas wells - Productivity - Sea level - Strike-slip faults

Uncontrolled terms: Geologic conditions - Permian - Sichuan Basin - Source-reservoir assemblage - Weathered crust karsts

Classification code: 407.3 Coastal Engineering - 471.1 Oceanography, General - 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.01.004

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

110. The status quo of natural gas line pipe inspection technologies abroad and its implications for China

Accession number: 20182905565437

Authors: Lu, Hongfang (1, 2); Wu, Xiaonan (3); Iseley, Tom (2); Matthews, John (2); Peng, Shanbi (3)

Author affiliation: (1) School of Petroleum Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Trenchless Technology Center, Louisiana Tech University, Ruston; LA; 71270, United States; (3) School of Civil Engineering and Architecture, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

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Abbreviated source title: Natur. Gas Ind.

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ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 24

Main heading: Inspection

Controlled terms: Gas pipelines - Inspection equipment - Natural gas - Voltage measurement

Uncontrolled terms: China - Condition assessments - Gas lines - Inspection technology - Metal loss detection - Online monitoring - Overseas - Visual inspection

Classification code: 522 Gas Fuels - 913.3.1 Inspection - 942.2 Electric Variables Measurements

DOI: 10.3787/j.issn.1000-0976.2018.02.014

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

111. Regional differences in the total factor natural gas utilization efficiency in China

Accession number: 20191306691394

Title of translation:

Authors: Zeng, Yong (1, 2); Zhang, Shuying (1); Li, Deshan (3)

Author affiliation: (1) School of Economics and Management, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Chuanxibei Division of PetroChina Southwest Oil & Gasfield Company, Mianyang; Sichuan; 621700, China; (3) School of Economics and Management, Southwest University of Science and Technology, Mianyang; Sichuan; 621010, China

Corresponding author: Li, Deshan(lwfaaa3@163.com)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 140-145

Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Improving the utilization efficiency of natural gas is one of the important ways to optimize the allocation of energy resources and achieve "green development". The previous studies have neglected the problems of factor substitution, non-radial and environmental constraints, resulting in some bias in calculation results. Therefore, based on the panel data of provinces, municipalities and autonomous regions in China from 2002 to 2016, the Undesirable-Window-DEA model was applied, considering the heterogeneity of energy consumption, to calculate the total factor natural gas efficiency. The following findings were achieved. (1) From a national perspective, the utilization efficiency of natural gas showed a continuous improvement trend from 2002 to 2016; (2) From a regional perspective, the natural gas utilization efficiency in the eastern, central and western regions is significantly different, being obviously lower in the west; (3) After 2007, the improvement rate in the central region far exceeds that in the east and west, and the east-central gap is narrowing; (4) The changes in natural gas utilization efficiency in each province (city or region) show

a distinct polarization trend. On this basis, the relevant countermeasures and suggestions were put forward: (1) to adhere to green development, optimize the industrial structure, and speed up the development of natural gas industry chain; (2) to implement the energy production revolution, and build a clean, low-carbon, safe and efficient energy supply system; (3) to optimize the energy consumption structure, and to continuously increase the proportion of natural gas consumption. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Energy efficiency

Controlled terms: Energy resources - Energy utilization - Gas industry - Gases - Natural gas - Natural gas deposits

Uncontrolled terms: China - DEA models - Environmental constraints - Factor substitutions - Non-radial - Regional differences - Total factor - Utilization efficiency

Classification code: 512.2 Natural Gas Deposits - 522 Gas Fuels - 525 Energy Management and Conversion

DOI: 10.3787/j.issn.1000-0976.2018.12.018

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

112. Accurate structural modeling on the northern section of complex structural belt at Longmenshan piedmont in the Sichuan Basin and its implications for oil and gas exploration

Accession number: 20191006600866

Title of translation:

Authors: Liang, Han (1); Xiao, Fusen (1); Ran, Qi (1); Guan, Xu (1); Han, Song (1); Chen, Xiao (1); Di, Guidong (1); Xie, Zhen (1); Liu, Ran (1)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610041, China

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Publication year: 2018

Pages: 26-32

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The northwestern area of the Sichuan Basin has experienced the superimposition of multi-stage thrust nappe deformation and its structural deformation is quite complicated. As a result, the structural mode of the complicated surging zone of Longmenshan piedmont is not figured out and the structural traps in the area are not ascertained. For reducing the risk of oil and gas exploration, accurate structural modeling was carried out based on the fault-related fold theory, combined with latest swath, log, surface and geological data after tectonic movement and surface and geological characteristics were analyzed. Then, the kinematic evolution process of the northern section of the complicated surging zone of Longmenshan piedmont was simulated by using the computer to study the structural geometry, analyze the structural deformation modes and confirm the faulting deformation characteristics and structural traps in this area. Finally, the favorable targets for future oil and gas exploration were presented. And the following research results were obtained. First, separated by Majiaoba fault and No. 1 fault, the northern section of the Longmenshan thrust zone can be sub-divided into three tectonic units, i.e., front nappe belt, surging zone and buried structural belt. Second, fault propagation fold with the occurrence of pitch and inversion is developed at the front tip of No.1 fault in the surging zone and a buried overthrust structure is identified at its lower wall. Third, four sets of vertically stacked Permian-Triassic microlithon are developed in the surging zone, which is structurally deformed in the Indosinian period and activated in the Himalayan period. Fourth, three sets of structural layers are formed in the buried frontal zone by the support of two detachment layers (i.e., the Cambrian shale and the gypsum salt layer of the Jialingjiang Fm, Lower Triassic), and its structural deformation mainly happens in the Himalayan period. In conclusion, the buried Upper Paleozoic structure (middle structural layer) at the lower wall of No.1 fault and Hongxing anticline at the upper wall are morphologically complete, so they are the favorable target areas for the future oil and gas exploration. In addition, the computer based kinematic evolution technology and the accurate structure modeling

provide an important technological support for the oil and gas exploration in complex structural belts. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 26

Main heading: Petroleum prospecting

Controlled terms: Deformation - Faulting - Gases - Geological surveys - Kinematics - Landforms - Structural geology

Uncontrolled terms: Buried structure - Fault-related fold - Longmenshan piedmont - Sichuan Basin - Structural evolution - Thrust nappe

Classification code: 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 931.1 Mechanics

DOI: 10.3787/j.issn.1000-0976.2018.11.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

113. Technology of flash gas treatment in sour water of sulfur-bearing gas fields

Accession number: 20185106260102

Title of translation:

Authors: Song, Bin (1); Li, Jing (2); Gao, Xiaogen (1)

Author affiliation: (1) Research Institute of Natural Gas Technology, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610213, China; (2) Chuanzhong Division of PetroChina Southwest Oil & Gasfield Company, Suining; Sichuan; 629000, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The water flash steam in sulfur-bearing gas field contains odorous gases (e. g. H₂S), so it cannot be discharged until it is disposed safely and effectively. So far, however, existing flash gas treatment technologies (alkali absorption, amine liquid absorption, liquid phase oxidation-reduction desulfurization and dry desulfurization) have not been compared and analyzed systematically, so in a way, their progress and application are restricted. In this paper, the sources, components, discharge characteristics and control technology of flash gas from gas-field sour water were analyzed, and the feasible methods to treat the flash gas were explored. Currently main desulfurization processes used for flash gas were mainly described from the aspects of technical principle, technical route and adaptability. The characteristics and applicable range of various desulfurization technologies were analyzed and compared. The treatment technologies were recommended according to sulfur throughput. Finally, the development direction and suggestions on these technologies were put forward. And the following research results were obtained. First, the flash gas from gas-field sour water is characterized by high sulfur content, high instantaneous flow rate, low average sulfur throughput per day and low pressure, and its disposal shall meet the H₂S emission requirements stipulated in GB/T 14554-1993. Second, each treatment technology for flash gas has its own advantages and disadvantages. The non-renewable amine liquid absorption method is technically simple with lower investment, but its operation cost is high and its purification degree is low. Dry desulfurization technology is simple and stable, but its investment is higher. The liquid phase oxidation-reduction desulfurization method is technically complex with high investment and poor stability. Third, the up-to-standard organized emission is the first choice for the disposal of flash gas from gas-field sour water. It is recommended to adopt the dry desulfurization method or the amine liquid adsorption method when the sulfur throughput is lower than 10 kg/d, and to adopt the liquid phase oxidation-reduction absorption method when the sulfur throughput is higher than 10 kg/d. In conclusion, it is necessary to further explore the exact change rules of quality, volume and velocity of flash gas from gas field water so as to support the industrial design. In addition, the devices shall be developed to be skid mounted, standard, modular and automatic. Furthermore, it is necessary to introduce the boosting recovery and the advanced lower pressure treatment technologies of other industries so as to complete the technological system. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Gas absorption

Controlled terms: Desulfurization - Gas industry - Gases - Hydrogen sulfide removal (water treatment) -

Investments - Liquids - Odors - Oxidation - Product design - Sulfur - Water absorption - Water treatment

Uncontrolled terms: Dry desulfurization - Flash gas - Liquid absorption - Liquid-phase oxidation - Sour water - Treatment technologies

Classification code: 445.1 Water Treatment Techniques - 522 Gas Fuels - 802.2 Chemical Reactions - 802.3 Chemical Operations - 804 Chemical Products Generally - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.10.015

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

114. A methodology for calculating the gas storing price of salt cavern UGSs considering the recycle value of cushion gas and the time value of capital

Accession number: 20191006600879

Title of translation:

Authors: Wang, Yuangang (1); Li, Shuping (1); Qi, Deshan (1); Li, Jianjun (1)

Author affiliation: (1) West-East Gas Pipeline Company, PetroChina Pipeline Company, Zhenjiang; Jiangsu; 212000, China

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: At present, domestic underground gas storages (UGSs) is treated only as an auxiliary facility of oil and gas pipeline companies without an independent pricing system. And when its gas storing price is calculated, the recycle value of cushion gas of oil/gas reservoir UGSs and salt cavern UGSs and the time value of capital are not taken into full consideration, so its calculation accuracy is not good enough. Independent and market-oriented operation is the inevitable development trend of UGSs in the future, so it is necessary to establish a gas storing pricing system suitable for domestic UGS operation mode. In this paper, the construction investment project of one salt cavern UGS in China was taken as the research object. A gas storing price calculating model considering the recycle of cushion gas was established by the dichotomy method. Then, the gas storing price of this case UGS under different internal rates of return (IRR) was calculated and the main factors influencing the gas storing price were analyzed. And the following research results were obtained. First, the IRR of 8% can be satisfied when the gas storing price is CNY 1.02 per m³. Second, when the working gas volume of a salt cavern UGS is determined, annual storage-withdrawal frequency (the ratio between the actual and designed annual working gas volume) is the most important factor influencing gas storing price, and the construction investment of underground and ground engineering takes the second place, while the effect of operation cost is the least. Third, the working efficiency of a salt cavern UGS is the maximum when the storage- withdrawal frequency is over 1.4, the value of which is thus recommended here. In conclusion, this gas storing price calculating method takes full consideration of the time value of capital and the recycle valve of cushion gas while ensuring a certain profit, so its calculation result is more reasonable. This method shall be popularized and applied to the calculation of similar salt cavern UGSs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Underground gas storage

Controlled terms: Caves - Cost engineering - Costs - Economics - Investments - Petroleum reservoir engineering - Recycling - Salt deposits - Sensitivity analysis

Uncontrolled terms: Annual storage-withdrawal frequency - Construction investments - Cushion gas - Dichotomy - Salt caverns - Time values

Classification code: 452.3 Industrial Wastes - 481.1 Geology - 505.1 Nonmetallic Mines - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics - 921 Mathematics - 971 Social Sciences

Numerical data indexing: Percentage 8.00e+00%
DOI: 10.3787/j.issn.1000-0976.2018.11.016
Compendex references: YES
Database: Compendex
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Data Provider: Engineering Village

115. Geological conditions and exploration potential of Permian marine-continent transitional facies shale gas in the Sichuan Basin

Accession number: 20185106260089

Title of translation:

Authors: Guo, Xusheng (1); Hu, Dongfeng (1); Liu, Ruobing (1); Wei, Xiangfeng (1); Wei, Fubin (1)

Author affiliation: (1) Sinopec Exploration Company, Chengdu; Sichuan; 610041, China

Corresponding author: Liu, Ruobing(liurb.ktnf@sinopec.com)

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Pages: 11-18

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Marine-continent transitional facies shale of the Longtan Fm, Upper Permian is an important source rock stratum in the Sichuan Basin. The previous researches on it mainly focus more on source rock evaluation, but less on shale gas accumulation. In this paper, the test and analysis results of Well DYS1, the coring well of Longtan Fm were dissected. Combined with the drilling results of its adjacent area, the organic rich shale in the Longtan Fm were studied from the aspects of distribution, geochemical, reservoir, gas-bearing characteristics and roof and floor conditions, and then compared with the shale strata with similar sedimentary background and good shale gas shows. And accordingly, its geological conditions for the formation of Longtan shale gas and its exploration potential were made clear. And the following research results were obtained. First, in the southeastern Sichuan Basin, the organic rich shale of transitional facies of Longtan Fm is developed with a thickness of more than 40 m. It is characterized by high brittle mineral content, high porosity, high total organic carbon (TOC), moderate thermal evolution (Ro) and good gas-bearing property. Therefore, it is geologically favorable for the formation of shale gas. Second, compared with the existing transitional facies shales at home and abroad, the Longtan shale is better in terms of porosity, TOC, Ro, gas content and other key parameters. Third, the type of organic matters is the main reason for the low development degree of organic pores in the Longtan shale. And during its shale gas exploration and selection, the coal seam enriched sections shall be avoided. In conclusion, considering the development degree, interlayer thickness, depth and preservation conditions of organic rich shale comprehensively, the Qijiang-Chishui area is the best exploration area for the transitional facies shale gas of Longtan Fm in the Sichuan Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Oil bearing formations

Controlled terms: Coal deposits - Gases - Geological surveys - Organic carbon - Petroleum prospecting - Porosity - Shale - Shale gas

Uncontrolled terms: Gas content - Gas exploration - Late Permian - Marine-continent transitional facies - Sichuan Basin - Thermal evolution - Total Organic Carbon

Classification code: 481.1 Geology - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids

Numerical data indexing: Size 4.00e+01m

DOI: 10.3787/j.issn.1000-0976.2018.10.002

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

116. Optimization on the unloading process of LNG receiving terminals with the optimal operation cost

Accession number: 20191006600877

Title of translation: LNG

Authors: Wu, Ming (1, 2); Zhu, Zuoliang (1); Sun, Dongxu (1, 2); He, Junnan (1); Tang, Kai (3); Hu, Benyuan (3); Tian, Shizhang (3)

Author affiliation: (1) Collage of Petroleum Engineering, Liaoning Shihua University, Fushun; Liaoning; 113001, China; (2) Collage of Pipeline and Civil Engineering, China University of Petroleum, Qingdao; Shandong; 266580, China; (3) PetroChina LNG Jiangsu Co., Ltd., Nantong; Jiangsu; 226400, China

Corresponding author: Sun, Dongxu(dx_sun@yahoo.com)

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Pages: 106-113

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The unloading process at liquefied natural gas (LNG) receiving terminals is an important part in the whole process of its operation. In actual operation, however, the operating parameters of the unloading process always remain unchanged, being the disadvantage of minimizing the operation cost of an LNG receiving terminal. In this paper, the operation stage in an unloading cycle was divided based on the operation condition of each equipment at the LNG receiving terminal. Then, a formula for calculating the operation power consumption of unloading process was built, and a dynamic simulation model of unloading process was established. In addition, an optimal operation model of unloading process with minimizing annual total power assumption as the objective function was constructed. Finally, the benefit of the case optimized by the model was compared with that of the non-optimized case. And the following research results were obtained. First, the establishment of the optimal operation model of unloading process enables the LNG receiving terminal to adjust the operating variables in time in different unloading conditions, so as to realize the optimal operation and reduce the power consumption. Second, the research results are applied to the PetroChina's Rudong LNG receiving terminal in Jiangsu province. The optimized operation scheme can save 13.0% power consumption compared with the original scheme. In conclusion, in the actual production process with complex working conditions, the optimal operation model of unloading process can reduce the power consumption by adjusting the operating parameters in real time, which is of practical significance for cost reducing and efficiency increasing of LNG receiving terminals. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Liquefied natural gas

Controlled terms: Computer simulation - Electric power utilization - Energy efficiency - Models - Operating costs - Unloading

Uncontrolled terms: Liquefied Natural Gas (LNG) - Lng receiving terminals - Objective functions - Operating parameters - Operation conditions - Operation optimization - Optimized operations - Unloading process

Classification code: 523 Liquid Fuels - 525.2 Energy Conservation - 691.2 Materials Handling Methods - 706.1 Electric Power Systems - 723.5 Computer Applications - 911.1 Cost Accounting

Numerical data indexing: Percentage 1.30e+01%

DOI: 10.3787/j.issn.1000-0976.2018.11.014

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

117. A high-efficiency development mode of shale gas reservoirs in mountainous areas based on large cluster horizontal well engineering

Accession number: 20185006230366

Title of translation:

Authors: Gao, Deli (1)

Author affiliation: (1) MOE Key Laboratory of Petroleum Engineering, China University of Petroleum, Beijing; 102249, China

Corresponding author: Gao, Deli(gaodeli@cast.org.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 8

Issue date: August 25, 2018

Publication year: 2018

Pages: 1-7

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: With the basic characteristics of regular horizontal wells, the so-called complex wells including horizontal extended-reach wells, multi-branch horizontal wells, U-shaped wells, cluster horizontal wells, etc., are advanced well types for the efficient development of low-permeability, unconventional, deep-water, and deep oil and gas reservoirs, which have been highly concerned all over the world. Significant progress at home and abroad has been made in relevant researches and practices and is expected to play an important role in the efficient development of shale oil and gas. To meet the basic needs of environment & safety, land conservation, cost reducing and efficiency increasing, it is urgent to create a unique shale gas efficient development mode. Therefore, an efficient shale gas development mode for mountainous areas and an engineering technology support system are presented based on large cluster horizontal-well engineering. An equation is thus obtained for calculating the maximum number of horizontal wells arranged allowably in "well factory" on a single platform. The general research and development of large extended-reach well technology are analyzed by expounding the basic concept of a large extended-reach well and its drilling elongation limit. And a calculation method is thus established to predict the maximum measured depth of open hole in extended-reach drilling. Moreover, some relevant research results and their significance for downhole tubular mechanics & mechanical extending limits in extended-reach drilling are also briefly introduced in this paper. The conclusions are drawn that, by following the idea of "integration of geology and engineering" in oil and gas development, these research results have a foreseeable application prospect in shale gas development in the mountainous areas in the future, and will contribute to new progress in China's "Shale Revolution". © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Horizontal wells

Controlled terms: Conservation - Efficiency - Gases - Geology - Infill drilling - Low permeability reservoirs - Offshore gas fields - Oil field development - Petroleum reservoir engineering - Shale gas

Uncontrolled terms: China - Design and control - Development modes - Extended reach drilling - Large clusters - Mountainous area

Classification code: 481.1 Geology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.08.001

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

118. Relationship between gas reservoir distribution and structural system of Upper Triassic Xujiahe Fm in the Sichuan Basin

Accession number: 20191006600864

Title of translation:

Authors: Liu, Shu (1); Ren, Xingguo (2); Yao, Shengxian (2); Liu, Ziping (2); Ning, Meng (3); Wang, Xin (1); Huang, Xiaohui (2)

Author affiliation: (1) Sinopec Southwest Oil & Gas Company, Chengdu; Sichuan; 610213, China; (2) CNPC Chuanqing Drilling Engineering Co., Ltd., Chengdu; Sichuan; 610056, China; (3) School of Earth and Space Sciences, Peking University, Beijing; 100871, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38**Issue:** 11**Issue date:** November 25, 2018**Publication year:** 2018**Pages:** 1-14**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: The gas reservoir of Upper Triassic Xujiahe Fm in the Sichuan Basin is characterized by "accumulation in the early stage, entrapment in the middle stage and activation in the late stage". In order to provide guidance for the prediction of hydrocarbon enrichment zone of Xujiahe Fm, we first plotted the regional structure map based on the 2D and 3D seismic merging data of the basin. Then, we displayed and described the structural features by means of the 3D visualization technology of low-angle vertical backlight irradiation. In addition, the structural system was classified according to the dynamic direction of regional structure and the structural interrelationship, and the formation stages of the structure were confirmed. Finally, based on drilling and testing data, the hydrocarbon enrichment zone of Xujiahe Fm was predicted. And the following research results were obtained. First, five structural systems are developed in Xujiahe Fm in the Sichuan Basin, including EW-oriented arc structure, NE-oriented linear structure, NE-oriented arc structure, SN-oriented to NW-oriented brush structure and NW-oriented arc structure. Second, the EW-oriented arc structure is formed due to the uplift and extrusion of the northern section of Longmenshan thrust belt in the Indosinian period, successively developed in the Yanshanian period and stabilized in the Himalayan period. And it is widely distributed in the basin. Third, the NE-oriented linear structure in the north of Western Sichuan Depression is resulted from the An'xian movement of Longmenshan thrust belt in the Indosinian period. Fourth, the NW-oriented arc structure before the Daba Mountain and the NE-oriented linear structure before the Huaying Mountain are stabilized in the Yanshanian period and successively developed in the Himalayan period. Fifth, the SN-oriented structure in the Western Sichuan Depression is formed due to the extrusion of the southern section of Longmenshan thrust belt in the Himalayan period. Sixth, the combination of SN structure to the east of Longquanshan fold belt and NW-oriented linear structure in the basin is a brush structure belt with Jiangyou paleo-uplift as the mainstay, which is resulted from the extrusion of the southern section of Longmenshan thrust belt in the Himalayan period. Seventh, the high-yield wells are usually distributed in the arc anticlines of Indosinian-Yanshanian period superimposed with the faults of Himalayan period. The structures of the Himalayan period are usually dry traps, and their fracture development zones are mostly water producing layers. The Indosinian synclines are also ineffective traps even though they are uplifted to anticlines in the Himalayan period. In conclusion, the confirmation of structural system stages can provide a technical support for the prediction and description of hydrocarbon enrichment zone of Xujiahe Fm in the Sichuan Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 37**Main heading:** Petroleum reservoirs**Controlled terms:** Extrusion - Forecasting - Hydrocarbons - Silicon compounds - Three dimensional computer graphics**Uncontrolled terms:** Formation stage - Late Triassic - Sichuan Basin - Structural feature - Structural systems - Western Sichuan**Classification code:** 512.1.1 Oil Fields - 723.2 Data Processing and Image Processing - 804.1 Organic Compounds**DOI:** 10.3787/j.issn.1000-0976.2018.11.001**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

119. Understanding and discussion on the international standard ISO 10723:2012

Accession number: 20184706088041**Title of translation:** ISO 10723 :2012**Authors:** Zhou, Li (1, 2, 3); Chen, Gengliang (2); Guo, Kaihua (1); Wang, Weijie (2, 3); Wang, Xiaoqin (2, 3)**Author affiliation:** (1) Faculty of Engineering, Sun Yat-Sen University, Guangzhou; Guangdong; 510006, China; (2) Natural Gas Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610213, China; (3) CNPC Key Laboratory of Natural Gas Quality and Energy Measurement, Chengdu; Sichuan; 610213, China**Corresponding author:** Chen, Gengliang(chengengliang@petrochina.com.cn)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38

Issue: 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 108-112**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: There is a big difference between the international standard ISO 10723:1995 of Performance Evaluation on Natural Gas Analysis System and the ISO 10723:2012 which was modified and issued in 2012. In order to ensure the smooth implementation of natural gas energy measurement in China, it is of great significant to understand and grasp the technological differences between ISO 10723:1995 and ISO 10723:2012 and the main technological content. In order to accelerate the transition of large-scale custody transfer metering mode of natural gas from the traditional volume metering to the energy metering, China issued national standard GB/T 22723-2008 of Energy Measurement of Natural Gas at the end of 2008. So far, however, the metering uncertainty of Calorific value of natural gas in commercial natural gas pipeline networks by the indirect method has not been evaluated overall. In this paper, the key technological points of ISO 10723:2012 were understood. Then, ISO 10723:2012 and ISO 10723:1995 were compared from the aspects of recommendation method and instrument operational performance requirement. Finally, the expression and calculation of mean correction factor and the application of Monte-Carlo method (MCM) simulation were discussed. And the following research results were obtained. First, ISO 10723:2012 is much more advantageous than ISO 10723:1995 in terms of application scope, MCM assessment procedure, uncertainty assessment and error setting. Second, the computational formula of mean correction factor is set up according to the principles illustrated in ISO/IEC Guide 98-3. Third, the average error of MCM simulation on the natural gas flowing into the UK pipeline network is in the range of -0.10-0.08 MJ/m³, which is in accordance with UK's natural gas access agreement. It is concluded that attention shall be paid to the application of mean correction method to gas chromatograph evaluation described in Appendix B of ISO 10723:2012. It is recommended to set the Maximum Permissible Errors (MPE) of Level-A metering system for energy metering in ISO 10723:2012 as $\pm 1.0\%$. Furthermore, when the reference condition is 15 (burning) and 15 and 101 325 Pa (metering), the MPE and the Maximum Permissible Bias (MPB) are 0.10 MJ•m⁻³ and 0.025 MJ•m⁻³, respectively, in the working condition that the Calorific value of virtual composition C6+ of natural gas is calculated based on the property of n-hexane. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18**Main heading:** ISO Standards**Controlled terms:** Calorific value - Errors - Gas chromatography - Gases - Hexane - Monte Carlo methods - Natural gas - Natural gas pipelines - Uncertainty analysis**Uncontrolled terms:** Composition analysis - GB/T 22723-2008 - ISO 10723:2012 - Precision evaluation - Uncertainty assessment**Classification code:** 522 Gas Fuels - 802.3 Chemical Operations - 804.1 Organic Compounds - 922.1 Probability Theory - 922.2 Mathematical Statistics**Numerical data indexing:** Pressure 1.01e+05Pa**DOI:** 10.3787/j.issn.1000-0976.2018.07.015**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

120. Accumulation mechanism of deep-seated tight sandstone gas reservoirs in the Duzhai Gas Field, Bohai Bay Basin

Accession number: 20184706088031**Title of translation:****Authors:** Lyu, Xueying (1); Jiang, Youlu (1); Liu, Jingdong (1); Xu, Tianwu (2)**Author affiliation:** (1) School of Geosciences, China University of Petroleum(East China), Qingdao; Shandong; 266580, China; (2) Exploration and Development Research Institute, Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457001, China**Corresponding author:** Jiang, Youlu(jiangyl@upc.edu.cn)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38

Issue: 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 34-43**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: The tight sandstone gas reservoirs that have been discovered and successfully developed so far are mainly distributed in the central-western China, and gas source rocks are prone to a humic type. However, the tight sandstone gas reservoir whose natural gas is genetically classified as oil-type gas is relatively rare, and has not been studied systematically. In this paper, the gas reservoir of the 3rd Member of Shahejie Fm, Eocene, Paleogene (hereinafter E2s3 for short) in the Duzhai Gas Field of the Dongpu Depression, Bohai Bay Basin, was taken as an example. The geological setting of tight sandstone gas accumulation in middle-lower sub-member of E2s3 (E2s3M-L) was studied systematically on the basis of geologic, geochemical and well logging data. Then, the gas accumulation process was divided into several stages according to diagenetic evolution of a reservoir, hydrocarbon charging driving and resistance force evolution and thermal evolution of source rocks. Finally, the gas accumulation process was analyzed based on the coupling relationship between the reservoir diagenetic evolution sequence and the hydrocarbon accumulation periods. And the following research results were obtained. First, E2s3 gas reservoir in the study area is genetically an oil-type tight sandstone gas reservoir, and its favorable hydrocarbon accumulation conditions include high-quality source rocks with high organic matter abundance and maturity, thick and widely distributed reservoirs, good matching relationship between a reservoir and its interbedded source rock, sufficient charging force and good sealing and preservation conditions. Second, the reservoirs of E2s3M-L are tight, so natural gas could hardly be charged effectively under the effect of buoyancy. Thus the overpressure caused by undercompaction and hydrocarbon generation is the main driving force for natural gas charging. Third, reservoirs of E2s3M-L experienced two stages of densification and two periods of hydrocarbon charging. Furthermore, the tight sandstone gas is overall characterized by the reservoirs getting tight prior to the hydrocarbon accumulation, and its hydrocarbon accumulation process can be divided into four evolution stages. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 34**Main heading:** Gases**Controlled terms:** Electric charge - Exploratory geochemistry - Gas industry - Hydrocarbons - Natural gas - Oil well logging - Petroleum reservoirs - Sandstone - Tight gas - Well logging**Uncontrolled terms:** Bohai Bay Basin - Charging mechanism - Dongpu depression - Eocene - Gas fields - Hydrocarbon accumulation - Tight sandstone gas**Classification code:** 481.2 Geochemistry - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 701.1 Electricity: Basic Concepts and Phenomena - 804.1 Organic Compounds**DOI:** 10.3787/j.issn.1000-0976.2018.07.005**Compendex references:** YES**Database:** Compendex

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Data Provider: Engineering Village

121. Oxidation absorption of H₂S by [bmim]OH and [A336][FeCl₄] mixed ionic liquids

Accession number: 20184706088040**Title of translation:** [bmim]OH [A336][FeCl₄]**Authors:** Wang, Jianhong (1); Yu, Xinping (1); Zhan, Minshu (1); Xu, Bo (1); Zhu, Ling (1); Wang, Yafei (1)**Author affiliation:** (1) Experimental Teaching Demonstration Center for Environmental Engineering, Beijing Institute of Petrochemical Technology, Beijing; 102617, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 100-107**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For the purpose of reducing the operating cost of a non-aqueous desulfurization system, the mixed ionic liquids were prepared by blending the basic 1-butyl-3-methylimidazolium hydroxide ([bmim]OH) with the cheap acidic tricaprylmethylammonium tetrachloroferrate ([A336][FeCl₄]) in the ratio of 0.2: 1, 0.5: 1, 0.8: 1, 1: 1 and 2: 1, respectively, and then they were used for H₂S oxidation absorption experiments. Accordingly, the properties of the mixed ionic liquids were researched systematically, including water solubility, density, IR spectrum, viscosity and acidic strength, and their sulfur capacity and reaction products were analyzed. And the following research results were obtained. First, the acidic strength and price of [A336][FeCl₄] quaternary ammonium ionic liquid are lowered than those of [bmim][FeCl₄] ionic liquid, so its adoption can reduce the cost of ionic-liquid non-aqueous desulfurization system. Second, the mixed ionic liquids have the frameworks of both [bmim]OH and [A336][FeCl₄], and their pH, viscosity and sulfur capacity increase with the increase of [bmim]OH. Third, the acidic strength of mixed ionic fluids is much lower than that of [A336][FeCl₄] ionic liquid, and it is beneficial to H₂S absorption. Moreover, its viscosity decreases dramatically with the increase of temperature, which is favorable for desulfurization at medium and high temperature. In conclusion, the medium-high temperature desulfurization system with the characteristics of lower cost, moderate acidity, lower viscosity and higher sulfur capacity can be developed when the molar ratio of [bmim]OH to [A336][FeCl₄] is in the range of 0.5: 1-1: 1. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Density of liquids

Controlled terms: Absorption - Acidity - Blending - Cost reduction - Desulfurization - Hydrogen sulfide - Ionic liquids - Ionic strength - Molar ratio - Sulfur - Sulfur compounds - Viscosity

Uncontrolled terms: Low costs - Medium-High temperatures - Sulfur capacity - [A336][FeCl₄] - [bmim]OH

Classification code: 801.1 Chemistry, General - 801.4 Physical Chemistry - 802.3 Chemical Operations - 804 Chemical Products Generally - 804.2 Inorganic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.07.014

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

122. Underground gas storage of Sinopec: Construction status analysis and development proposals

Accession number: 20185006230381

Title of translation:

Authors: Zhang, Guanghua (1)

Author affiliation: (1) Economic Development Research Institute, Sinopec Shengli Oilfield Company, Dongying; Shandong; 257000, China

Corresponding author: Zhang, Guanghua(zhangguanghua.slyt@sinopec.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 112-118

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: During the gas-peaking months from winter in 2017 to spring in 2018, shortage of gas supply frequently occurred in many regions or provinces in China, which exposes many problems like the slow development of gas storage peak-shaving measures and facilities. As one of the major state-owned energy suppliers, Sinopec will have to accelerate the construction of natural gas storage facilities and explore many ways in improving those facilities' utilization. In view of this, this paper first summarizes the status and characteristics of Sinopec's underground gas storage (UGS), which started late in a small number but developed with advanced technologies and in a great scale. Then, the main challenging issues were pointed out for Sinopec as follows. (1) UGS construction involves such problems as a high cost, a long construction period and being difficult to raise funds. (2) UGS sites are difficult to find and high technical requirements will be necessary for construction. (3) Due to a short history, UGS operation

and management experiences are far from enough. (4) For lack of supporting policies, UGS construction process is severely influenced. On this basis, the following proposals were thus presented: to accelerate UGS construction process and improve UGS peak-shaving capacity; to coordinate the relationship between local government and enterprise and do a good job of UGS planning and siting work; to make breakthroughs in UGS key technologies and attach great importance to UGS safety management; to optimize UGS operation efficiency and cut down cost in construction and management; to use flexibly and implement various incentive policies and accelerate UGS development in a commercial way; and to learn lessons and experiences from those developed countries and explore a way for China to implement strategic employment of UGS construction. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Underground gas storage

Controlled terms: Construction - Natural gas

Uncontrolled terms: Challenging issues - Construction status - Development proposals - Sinopec - Storage systems - Technical breakthrough

Classification code: 405 Construction Equipment and Methods; Surveying - 522 Gas Fuels

DOI: 10.3787/j.issn.1000-0976.2018.08.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

123. Development characteristics and main controlling factors of natural fractures in deep carbonate reservoirs in the Jizhong Depression

Accession number: 20191006600867

Title of translation:

Authors: Xiao, Yang (1); Liu, Guoping (2, 3); Han, Chunyuan (1); Zhu, Jiangwei (2, 3); Zhou, Cong'an (1); Lü, Wenya (2, 3); Gao, Yuan (1); Zeng, Lianbo (2, 3); Ma, Xuefeng (1)

Author affiliation: (1) PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China; (2) College of Geosciences, China University of Petroleum, Beijing; 102249, China; (3) State Key Laboratory of Petroleum Resources and Prospecting, Beijing; 102249, China

Corresponding author: Liu, Guoping(liugp1ly228@sina.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 11

Issue date: November 25, 2018

Publication year: 2018

Pages: 33-42

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The carbonate reservoir of Early Paleozoic Ordovician is an important area for deep oil & gas exploration in the Jizhong Depression. Fracture is one of the main factors affecting oil & gas enrichment and single well productivity in this type of reservoir. For better guiding the oil & gas exploration and deployment in the Jizhong Depression, the development characteristics and controlling factors of fractures in the Ordovician carbonate reservoirs in this area were studied based on the data of field outcrops, cores, thin sections and image logging. And combined with production data and exploration achievements, the influence of the development heterogeneity of natural fractures on the distribution of oil and gas production was discussed. And the following research results were obtained. First, four types of fractures are developed in the deep-seated Ordovician carbonate reservoirs in the Jizhong Depression, including tectonic fractures, diagenetic fractures, dissolution fractures and weathering fractures, among which tectonic fracture is the main type of natural fracture in the study area. They are mostly of NNE-SSW strike. Many of them are high-angle and vertical fractures and most of them are unfilled. Their opening is less than 30 μm , and the fracture density is 1.6-3.0 fractures/m. And they are mainly formed in three stages and fractures of different periods are cut and limited mutually. Second, the development degree of natural fractures is mainly controlled by three factors, i.e., lithology, structure and layer thickness. Natural fractures in dolomite are more developed than those in limestone and the development in mudstone is poor. Natural fractures near faults and in the upper wall are more developed. The development degree of fractures is closely related to rock thickness. As rock thickness increases, the density of layer-

controlled tectonic fractures decreases as a power function. Third, in different depressions, different tectonic zones and different structural parts of the same tectonic belt, the heterogeneity of the natural fractures is quite strong, and oil and gas production varies greatly. In conclusion, these research results provide a reliable geological basis for the oil & gas exploration and development of deep-seated Ordovician carbonate reservoirs in the Jizhong Depression. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 37

Main heading: Fracture

Controlled terms: Carbonation - Gases - Geological surveys - Lime - Lithology - Oil field development - Oil wells - Petroleum prospecting - Petroleum reservoirs - Reservoirs (water) - Sedimentary rocks - Tectonics - Weathering

Uncontrolled terms: Carbonate rock - Controlling factors - Deep zone - Development characteristics - Jizhong Depression - Natural fracture - Oil and gas production - Ordovician

Classification code: 441.2 Reservoirs - 481.1 Geology - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 802.2 Chemical Reactions - 804.2 Inorganic Compounds - 951 Materials Science

Numerical data indexing: Size 3.00e-05m

DOI: 10.3787/j.issn.1000-0976.2018.11.004

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

124. Pore characteristics and evolution of Wufeng-Longmaxi Fms shale gas reservoirs in the basin-margin transition zone of SE Chongqing

Accession number: 20191306691378

Title of translation: -

Authors: Gao, Yuqiao (1); Cai, Xiao (1); Zhang, Peixian (1); He, Guisong (1); Gao, Quanfang (1); Wan, Jingya (1)

Author affiliation: (1) Research Institute of Exploration and Development, Sinopec East China Oil & Gas Company, Nanjing; Jiangsu; 210011, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Publication year: 2018

Pages: 15-25

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: At present, researches on the pore evolution of shale reservoir and its evolution mechanism are still at such a groping stage that a consensus has not yet reached. Based on core analysis and thermal simulation experiments, the pore types, pore structures and pore-size change rules of shale gas reservoirs of Upper Ordovician Wufeng-Lower Silurian Longmaxi Fms in the southeastern (SE) Sichuan Basin and its basin-margin transition zone (hereinafter referred to as the basin-margin transition zone of SE Chongqing) were studied by means of argon ion polishing-scanning electron microscopy and atomic force microscopy. Then, the evolution characteristics of organic pores were discussed, and the influence of associated minerals on pore evolution was analyzed. Finally, a pore evolution model for the shale gas reservoirs in this area was established. And the following research results were obtained. First, three types of reservoir spaces are mainly developed in the high-quality shale reservoirs of Wufeng-Longmaxi Fms in this area, including fracture, inorganic pore and organic pore. And the organic pores provide the primary reservoir space of shale gas, which can be divided into four categories, i.e., amorphous kerogen pores, structured kerogen pores, asphaltene pores and paleontology fossil pores. Second, organic contracted fissures are related to the contraction of organic matters, first appearing on one side of the organic matters and then becomes wider and wider with the increase of temperatures. Third, organic pores are mostly the "spongy" pores distributed densely inside the organic matters. When R_o is in the range of 1.56-3.50%, macropores and mesopores are dominant. And when R_o exceeds 3.50%, macropores decrease while mesopores and micropores increase. Fourth, the types of organic matters and the content of associated minerals (e.g. clay minerals, siliceous particles and pyrite) play an important role in the development of pores. In conclusion, the pore evolution law of Wufeng-Longmaxi shale in the basin-margin transition zone of SE Chongqing is that with the increase of burial depth, inorganic porosity decreases significantly, organic

porosity increases first and then decreases, and the total porosity shows a change trend of decreasing first, then increasing and finally decreasing continuously. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 32

Main heading: Organic minerals

Controlled terms: Atomic force microscopy - Biogeochemistry - Biological materials - Gases - Kerogen - Oil shale - Particle size analysis - Petroleum reservoirs - Pore size - Pore structure - Pyrites - Reservoirs (water) - Scanning electron microscopy - Shale gas

Uncontrolled terms: Inorganic pore - Organic pore - Pore evolution - Sichuan Basin - Silurian - Transition zones

Classification code: 441.2 Reservoirs - 461.2 Biological Materials and Tissue Engineering - 481.2 Geochemistry - 512.1 Petroleum Deposits - 512.1.1 Oil Fields - 522 Gas Fuels - 741.3 Optical Devices and Systems - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 1.56e+00% to 3.50e+00%, Percentage 3.50e+00%

DOI: 10.3787/j.issn.1000-0976.2018.12.002

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

125. Chemical-Microwave-Ultrasonic compound conditioning treatment of highly-emulsified oily sludge in gas fields

Accession number: 20191306691393

Title of translation: --

Authors: Su, Biyun (1); Huang, Li (1); Li, Shanjian (1); Ding, Liqin (1); Liu, Bo (1); Zhang, Ao (1)

Author affiliation: (1) College of Chemistry & Chemical Engineering, Xi'an Shiyou University, Xi'an; Shaanxi; 710065, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 134-139

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The highly-emulsified oily sludge in gas fields is complex in components and serious in emulsification, which makes effective reduction extremely difficult only by a single direct mechanical separation method such as microwave heating, ultrasonic treatment, chemical conditioning, etc. In view of this, this paper presented a new chemical-physical compounding conditioning technology for such highly emulsified oily sludge in gas fields. The experimental samples, from the Mizhi Natural Gas Processing Plant of the PetroChina Changqing Oilfield Company, were treated through chemical conditioning, from which the optimal formula, dosages and dosing order were determined. On this basis, the compound technology of chemical-physical conditioning was applied to reduce the specific resistance to filtration (SRF) of the sludge, thus achieving a satisfactory result. The following results were obtained. (1) The chemical conditioning agent with the formula of the oxidant MN-S, calcium oxide and sodium hydroxide was proved to achieve the fastest dewatering speed, and the specific resistance of sludge can be reduced from 130.3 to 3.81 trillion m³ per kg. (2) Comparison between microwave and ultrasonic conditioning methods shows that the latter is better in reducing the SRF (the ultrasonic frequency of 40 kHz was applied to reduce the SRF down to 14.01 trillion m³ per kg after 4 minutes of conditioning treatment). (3) The ultrasonic treatment effect after chemical conditioning is the best; the SRF was reduced to 2.77 trillion m³ per kg, and the moisture content of the sludge after mechanical dewatering was only 68.71%, decreased by 21.46% compared with the original content of 90.17%. In conclusion, this presented chemical-microwave-ultrasonic compound conditioning technology can reduce the sludge's SRF and the moisture content of filter cakes so as to achieve effective reduction of the highly-emulsified sludge in gas fields. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Natural gas conditioning

Controlled terms: Chemical resistance - Compounding (chemical) - Dewatering - Emulsification - Gas industry - Gases - Lime - Microwave heating - Microwaves - Moisture - Moisture determination - Natural gasoline plants - Oilfield chemistry - Sodium hydroxide - Ultrasonic equipment

Uncontrolled terms: Changqing oilfield companies - Chemical conditioning - Conditioning treatment - Mechanical separation - Natural gas processing plants - Oily sludges - Sludge - Specific resistance to filtration

Classification code: 513.2 Petroleum Refineries - 522 Gas Fuels - 711 Electromagnetic Waves - 711.1 Electromagnetic Waves in Different Media - 753.2 Ultrasonic Devices - 802.2 Chemical Reactions - 802.3 Chemical Operations - 804.2 Inorganic Compounds - 944.2 Moisture Measurements

Numerical data indexing: Frequency 4.00e+04Hz, Percentage 2.15e+01%, Percentage 6.87e+01%, Percentage 9.02e+01%, Time 2.40e+02s

DOI: 10.3787/j.issn.1000-0976.2018.12.017

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

126. Differences in natural gas hydrate migration and accumulation between GMGS1 and GMGS3 drilling areas in the Shenhu area, northern South China Sea

Accession number: 20183805830755

Authors: Zhang, Wei (1, 2, 3); Liang, Jinqiang (1, 2); He, Jiaxiong (4); Cong, Xiaorong (5); Su, Pibo (1, 2); Lin, Lin (1, 2); Liang, Jin (1, 2)

Author affiliation: (1) Guangzhou Marine Geological Survey, China Geological Survey, Guangzhou; Guangdong; 510075, China; (2) MLR Key Laboratory of Marine Mineral Resources, Guangzhou; Guangdong; 510075, China; (3) School of Marine Sciences, Sun Yat-sen University, Zhuhai; Guangdong; 519082, China; (4) University of Chinese Academy of Sciences, Beijing; 100049, China; (5) Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences, Guangzhou; Guangdong; 510640, China

Corresponding author: Liang, Jinqiang(ljqiang@hyd.z.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

Number of references: 32

Main heading: Gas hydrates

Controlled terms: Chimneys - Efficiency - Faulting - Gases - Hydration - Infill drilling - Natural gas - Seismology

Uncontrolled terms: Accumulation mechanisms - Difference - Gas sources - GMGS1 drilling area - GMGS3 drilling area - Migration and accumulation - Northern South China Sea - Shenhu area

Classification code: 402.1 Industrial and Agricultural Buildings - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 522 Gas Fuels - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.03.017

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

127. A formation pressure prediction method for deepwater basins under high temperatures and high pressures

Accession number: 20183805830741

Authors: Peng, Hailong (1); Liu, Bing (1); He, Jianwei (1); Li, Wentuo (1); Wu, Yunpeng (1)

Author affiliation: (1) CNOOC China Limited Zhanjiang Branch, Zhanjiang; Guangdong; 524057, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

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Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: At present, the formation prediction methods used in the high-temperature and high-pressure areas of the Qiongdongnan Basin, South China Sea, mainly include the logging method, empirical formula and seismic method, etc., but their application effects are not satisfactory due to their limitations and the complexity of exploration targets. In order to increase the prediction accuracy of formation pressure in this area, we analyzed the principles of conventional empirical formula method. Considering the diversity of regional compaction settings, combined with the existing drilling data, the normal compaction velocity trend lines were established for different zones and structures to fit the velocity-depth relationship and calculate the pore pressure. Thus, a new conventional empirical formula method (hereinafter "a new method" for short) was developed. On the basis of Stephen formula, the formation fracturing pressure was calculated by introducing formation tensile strength and by selecting the value of Poisson's ratio segmentally. The following research results were obtained. First, by virtue of the normal compaction velocity trend lines established in this paper, the compaction velocity of the target formations in the normal compaction range can be fitted directly without any lithological identification of the target area. Second, when the formation depth reaches a certain value, the compression/shear wave ratio and the Poisson's ratio are hardly affected by the depth and this characteristic of Poisson's ratio can be used to calculate the fracturing pressure segmentally. Third, when this new method was used to predict the formation pressure coefficient, the absolute error was less than 0.07 and the relative error was less than 5%. In conclusion, the pressure prediction platform which is developed based on this new method can be used to predict the formation pressure of deepwater basins under high temperatures and high pressures in the South China Sea, and the prediction results are accurate with a small error range. Obviously, it satisfies the design requirement, increases the working efficiency and presents a promising application prospect. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 26

Main heading: Forecasting

Controlled terms: Compaction - Errors - Fracture - High pressure effects - Lithology - Poisson ratio - Pore pressure - Tensile strength - Velocity

Uncontrolled terms: Deepwater basins - Formation pressure - Fracturing pressure - High temperature and high pressure - Pressure coefficients - Qiongdongnan basin - South China sea

Classification code: 481.1 Geology - 483.1 Soils and Soil Mechanics - 951 Materials Science

Numerical data indexing: Percentage 5.00e+00%

DOI: 10.3787/j.issn.1000-0976.2018.03.003

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

128. Reservoir effectiveness evaluation based on comprehensive reservoir quality evaluation indexes of well logging: A case study on the Permian Qixia Fm in the western Sichuan Basin

Accession number: 20182905565427

Authors: Qi, Baoquan (1); Zhao, Zuo'an (2); He, Hongju (1); Huang, Hong (1); Cao, Zhen (1)

Author affiliation: (1) Southwest Division of CNPC Logging Co., Ltd., Chongqing; 400021, China; (2) PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China

Corresponding author: Zhao, Zuo'an(zhaoza@petrochina.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 25-32

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the western Sichuan Basin, the Permian Qixia Fm grained dolomite reservoirs are currently the new focus of natural gas exploration and development. The Qixia Fm is characterized by developed dissolved vugs and fractures, low matrix porosity and strong heterogeneity, so evaluation faults tend to occur if reservoir effectiveness is evaluated by means of the traditional porosity evaluation, and consequently the predicted gas well productivity is more deviated from the actual measurement. In this paper, the characteristics of Qixia Fm reservoirs in this area were firstly analyzed. Then, the method and criterion of the effectiveness evaluation of Qixia Fm reservoirs in the western Sichuan Basin were established by means of numerical simulation and special logging data processing. And the following research results were obtained. First, surface porosity of matrix pores and secondary dissolved vugs calculated based on the special processing of conventional logging and electric imaging logging can be used to evaluate the reservoir properties of reservoirs. Second, deep and shallow dual lateral logging in combination with electric imaging logging and Stoneley wave energy data can be used to evaluate the filtration capacity of reservoirs. Third, the criterion of effective Qixia Fm reservoirs is established, including storage coefficient ≥ 0.6 , deep lateral resistivity 0.6% , Stoneley wave attenuation $\geq 10\%$ and comprehensive reservoir evaluation index ≥ 0.25 , and this evaluation criterion can well characterize reservoir quality and gas well productivity. The field application results of this evaluation method and evaluation criterion indicate that the coincidence rate of reservoir effectiveness has increased from 70% to over 90%. Thus, the technical difficulties related to heterogeneous carbonate reservoir effectiveness evaluation are basically solved. Besides, they provide a basis for the determination of production test layer selection, completion engineering and development scheme so as to cut down the natural gas exploration and development cost. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 7

Main heading: Quality control

Controlled terms: Cost engineering - Data handling - Digital storage - Geological surveys - Logging (forestry) - Matrix algebra - Natural gas - Natural gas well production - Natural gas wells - Numerical methods - Oil field development - Petroleum prospecting - Petroleum reservoir evaluation - Porosity - Porous materials - Productivity - Reservoirs (water) - Wave energy conversion - Well logging

Uncontrolled terms: Adaptability - Effectiveness - Filtration capacity - Permian - Reservoir quality - Sichuan Basin - Western area

Classification code: 441.2 Reservoirs - 481.1 Geology - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 615.6 Wave Energy - 722.1 Data Storage, Equipment and Techniques - 723.2 Data Processing and Image Processing - 911 Cost and Value Engineering; Industrial Economics - 913.3 Quality Assurance and Control - 921.1 Algebra - 921.6 Numerical Methods - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 1.00e+01%, Percentage 9.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.02.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

129. Test and analysis on the permeability of fractured fractures in shale reservoirs

Accession number: 20183805830745

Authors: Yin, Congbin (1)

Author affiliation: (1) Downhole Operation Company, CNPC Chuanqing Drilling Engineering Company Limited, Chengdu; Sichuan; 610052, China

Corresponding author: Yin, Congbin(yincb@cnpc.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: March 25, 2018

Publication year: 2018

Pages: 60-68

Language: Chinese

ISSN: 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: In order to improve the effectiveness of shale gas SRV (stimulated reservoir volume), it is necessary to evaluate and study the permeability of different types of fractured fractures in shale and its influential factors. In this paper, the mineral composition characteristics, reservoir pore and fracture characteristics of shale were investigated, and the permeability of three types of fractured fractures in shale (i.e., in-situ closed type, shear self-propped type and single-layer propped type) was tested. Besides, the effects of fracture type, fracture surface roughness, carbonate content, shale bedding and confining pressure on the permeability of fractured fractures in shale reservoirs were studied systematically. The following research results were obtained. First, the permeability-pressure relationship of in-situ closed fracture is in accordance with the Walsh theory. The permeability decreases with the increase of confining pressure and it is in the range of 0.13-16.75 mD. In-situ closed fracture plays the same role in increasing the productivity of shale gas reservoirs with or without proppant filling or dislocation. Second, compared with in-situ closed fracture permeability, the shear self-propped fracture permeability is 1-2 orders of magnitude (7.53-88.48 mD) higher, and single-layer propped fracture permeability is 2-3 orders of magnitude (9.98-771.82 mD) higher. Third, the larger the fracture surface roughness, the higher the fracture permeability. And there is a better positive correlation between the fractal dimension and the fracture permeability. Fourth, the permeability-pressure relationship of shear self-propped fracture and single-layer propped fracture is, to some extent, deviated from the Walsh theory, which reflects the influence of self-propped point crushing, proppant embedding and crushing. In conclusion, the experimental results can be used as the reference for the selection of shale fracturing technologies and the optimization of parameters. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 22**Main heading:** Petroleum reservoir engineering**Controlled terms:** Crushing - Fractal dimension - Fracture - Mechanical permeability - Petroleum reservoirs - Proppants - Rock pressure - Shale gas - Surface roughness**Uncontrolled terms:** Closed fracture - Fracture characteristics - Fracture permeability - Laboratory test - Optimization of parameters - Permeability pressure - Positive correlations - Stimulated reservoir volumes**Classification code:** 502.1 Mine and Quarry Operations - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 921 Mathematics - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science**DOI:** 10.3787/j.issn.1000-0976.2018.03.007**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

130. Change of water saturation in tight sandstone gas reservoirs near wellbores

Accession number: 20183905863717**Authors:** Ma, Hongyu (1, 2); Gao, Shusheng (3); Ye, Liyou (3); Liu, Huaxun (3); Xiong, Wei (3); Shi, Jianglong (4); Wang, Lin (1, 2); Wu, Kang (1, 2); Qi, Qingshan (5); Zhang, Chunqiu (6)**Author affiliation:** (1) University of Chinese Academy of Sciences, Beijing; 100190, China; (2) Institute of Porous Flow & Fluid Mechanics, University of Chinese Academy of Sciences, Langfang; Hebei; 065007, China; (3) Department of Porous Flow & Fluid Mechanics, PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (4) PetroChina Research Institute of Petroleum Exploration & Development - Northwest, Lanzhou; Gansu; 730020, China; (5) Exploration and Development Research Institute, PetroChina Qinghai Oilfield Company, Dunhuang; Gansu; 736202, China; (6) Measurement Supervision and Inspection Center of Experimental Testing Institute, PetroChina Xinjiang Oilfield Company, Karamay; Xinjiang; 843000, China**Corresponding author:** Gao, Shusheng(gaoshusheng69@petrochina.com.cn)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 5**Issue date:** May 25, 2018**Publication year:** 2018**Pages:** 77-86**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Tight sandstone gas reservoirs commonly contain water, so liquid loading often appears near wellbores, leading to production decline and even shutdown of gas wells. Therefore, the study on the change of water saturation near wellbores is of great significance to understanding the water production mechanisms of gas wells. In this paper, a set of physical simulation experiment procedures of identifying the change of water saturation near wellbores was designed according to the principle of radial well seepage of gas wells, and the production performance after vertical well fracturing in gas reservoirs was simulated by connecting tight cores with a diameter of 10.5 cm, 3.8 cm and 2.5 cm in series in a descending order of distance. According to the depressurizing production mode of gas wells, tubes with small diameters of 20, 30, 40 and 50 μm were used to simulate gas well tubing to control the gas production rate. And the change of water saturation near wellbore in the process of depletion production and its influencing factors were investigated. Finally, combined with actual data of production wells, the water saturation and water production of gas wells near wellbores and in different zones were calculated at the above four different small diameters of tubes and the changes thereof were also analyzed. The following results were obtained. First, each gas production rate corresponds to a critical water saturation. When the initial water saturation is lower than the critical value, the formation water flowing near the wellbore and in the middle zone can be carried out along with the production of gas and no liquid loading is formed. Second, when the initial water saturation is higher than the critical value, a large amount of formation water migrating from the distal zones accumulates near the wellbore, and thus liquid loading occurs at the bottom hole. Third, when the initial water saturation is equal to the critical value, the higher the gas production rate is, the more easily liquid loading tends to form near the wellbore. Fourth, for the same water saturation, water production increases and recovery factor decreases with the increase of gas production rate. In conclusion, the cumulative water production chart of a gas well generated by the physical simulation experiment method proposed in this paper agrees well with the water production behavior of the corresponding gas well. The research results are conducive to the effective prediction of gas well water production and can be used as guidance for the reasonable gas well water control. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Loading

Controlled terms: Boreholes - Gases - Liquids - Natural gas well production - Natural gas wells - Oil field equipment - Petroleum reservoirs - Produced Water - Sandstone - Seepage - Tight gas - Well stimulation

Uncontrolled terms: Gas productions - Gas well - Physical - Tight sandstone gas - Water control - Water saturations - Wellbore

Classification code: 482.2 Minerals - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 691.2 Materials Handling Methods

Numerical data indexing: Size 1.05e-01m, Size 2.50e-02m, Size 3.80e-02m, Size 4.00e-05m, Size 5.00e-05m

DOI: 10.3787/j.issn.1000-0976.2018.05.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

131. Combustion performance tests of hydrogen-natural gas mixtures as fuels in domestic gas appliances

Accession number: 20182905565439

Authors: Yan, Rongsong (1, 2); Gao, Wenxue (1, 2); Zhang, Yangjun (1); Zhang, Jianhai (1)

Author affiliation: (1) China Quality Supervising and Test Center For Gas Appliances, Tianjin; 300384, China; (2) North China Municipal Engineering Design & Research Institute Co., Ltd., Tianjin; 300074, China

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Abbreviated source title: Natur. Gas Ind.

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 16

Main heading: Gases

Controlled terms: Domestic appliances - Energy efficiency - Gas appliances - Gas fuel analysis - Gas mixtures - Hydrogen - Natural gas

Uncontrolled terms: Adaptability - Gas interchangeability - Gas sources - Mixing ratios - Thermal Performance

Classification code: 522 Gas Fuels - 525.2 Energy Conservation - 804 Chemical Products Generally

Numerical data indexing: Magnetic_Flux_Density 1.20e+01T, Percentage 2.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.02.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

132. Environment impact appraisal (EIA) for shale gas development in China: Present status, existing issues and proposals

Accession number: 20185006230382

Title of translation: ,

Authors: Yang, Demin (1, 2); Yu, Yuanxiu (3); Liang, Rui (2); Xia, Hong (1); Yuan, Jianmei (1)

Author affiliation: (1) National Joint Engineering Research Center for Shale Gas Exploration and Development, Chongqing Institute of Geology and Mineral Resources, Chongqing; 401120, China; (2) Appraisal Center for Environment & Engineering of the Ministry of Environmental Protection, Beijing; 100011, China; (3) Appraisal Center for Environment & Engineering of Chongqing, Chongqing; 401121, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Many environmental issues involved in the shale gas development have been highly concerned in China and the environment impact appraisal (EIA) is of great significance to the construction of ecological civilization and the balance being maintained between shale gas resources exploration and ecosystem and environmental protection. In view of this, according to the present status and environment-related characteristics of shale gas development, we analyzed the potentially resulted environment impacts during the drilling, gas recovery, and well closed periods, as well as the involved EIA management status. And we pointed out the main problems as follows in such EIA management and documentation in China. (1) There lacks top layer design in the environmental supervision system, and there are no pertinent codes or laws. (2) The time of EIA intervention cannot be clearly determined and EIA classification and classification management are not unified. (3) EIA contents and depth are far from enough and lack of emphasis. (4) Neither the public participation mechanism nor information disclosure is not complete. (5) The post evaluation and tracking assessment of a project are not in time. On this basis, we presented the following countermeasures and proposals. (1) The top layer design should be strengthened in the environmental supervision system and a strict EIA system should be established, improved and implemented for shale gas development. (2) Fundamental studies should be carried out on environmental protection technologies and environment impacts especially in the national shale gas demonstration zones. (3) Programming environmental impact assessment (PEIA) should be developed in the key shale gas production areas and soon taken into field practices, and exploratory studies should be carried out on shale gas strategic environmental assessment. (4) An EIA big-data processing platform should be set up to make environmental supervision capacity and level highly improved. (5) Regulatory mechanisms for EIA institutions and practitioners should be established and improved to focus on the market regulation and accountability of EIA institutions. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Environmental impact

Controlled terms: Air pollution - Data handling - Energy resources - Environmental impact assessments - Environmental management - Environmental regulations - Environmental technology - Gases - Hydraulic fracturing - Petroleum deposits - Petroleum prospecting - Shale gas

Uncontrolled terms: China - Classification managements - Countermeasure and proposal - Environment impact - Environmental supervision - Gas development - Information disclosure - Strategic environmental assessments

Classification code: 451 Air Pollution - 454 Environmental Engineering - 454.2 Environmental Impact and Protection - 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 723.2 Data Processing and Image Processing

DOI: 10.3787/j.issn.1000-0976.2018.08.017

Funding Details: Number: -, Acronym: -, Sponsor: Ministry of Environmental Protection;

Funding text: Yang Demin^{1,2}, Yu Yuanxiu³, Liang Rui², Xia Hong¹ & Yuan Jianmei¹ (1. National Joint Engineering Research Center for Shale Gas Exploration and Development//Chongqing Institute of Geology and Mineral Resources, Chongqing 401120, China; 2. Appraisal Center for Environment & Engineering of the Ministry of Environmental Protection, Beijing 100011, China; 3. Appraisal Center for Environment & Engineering of Chongqing, Chongqing 401121, China) *NATUR. GAS IND. VOLUME 38, ISSUE 8, pp.119-125, 8/25/2018. (ISSN 1000-0976; In Chinese)*

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

133. Unconventional casing programs for subsalt ultra-deep wells with a complex pressure system: A case study on Well Wutan 1 in the Sichuan Basin

Accession number: 20184706088036

Title of translation: -1

Authors: Zou, Lingzhan (1); Mao, Yuncai (2); Liu, Wenzhong (3); Wang, Haige (1); Guo, Jianhua (3); Deng, Chuanguang (3); Zheng, Youcheng (3); Huang, Hongchun (1); Li, Jie (3); Yue, Hong (3); Chen, Gang (3)

Author affiliation: (1) CNPC Engineering Technology Research Institute Co., Ltd., Beijing; 102206, China; (2) PetroChina Exploration & Production Company, Beijing; 100083, China; (3) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Well Wutan 1 is a wildcat well deployed in the Dazhou-Kaijiang paleo-uplift, eastern Sichuan Basin and its design depth is 7 570 m. The Cambrian and Sinian strata are its main exploration targets, and the strata below the Sinian in this well are geologically uncertain with a high risk. A large section of gypsum-salt layer may be encountered in the Cambrian and the longitudinal pressure system is complex. It is predicted that the bottomhole temperature is up to 175, and the bottomhole liquid column pressure exceeds 140 MPa, and there is hydrogen sulfide. As a result, the casing program design is confronted with great challenges. In this paper, the difficulties and risks of drilling engineering were analyzed. Then, a casing program was designed and optimized referring to the successful drilling experience of subsalt ultra-deep wells at home and abroad, combined with the pressure system characteristics of Well Wutan 1 and the creep performance of gypsum-salt layers. Finally, the casing program was applied on site. And the following research results were obtained. First, in order to prevent leakage, blowout and pressure difference induced pipe sticking in the open hole section, it is determined that the casing program shall be in the pattern of six-section casing with 5 setting positions. Second, no setting position is needed in the Carboniferous pressure depleted reservoir for it is lithologically tight and pressure difference induced pipe sticking and leakage is less risky. Third, for achieving salt layer specialization, one section of casing is specially designed for the Cambrian gypsum-salt layer and its collapse strength is 160 MPa to prevent collapse by salt creep. Fourth, Well Wutan 1 is drilled successfully to the expected strata and its total depth is 8 060 m. In conclusion, the unconventional six-section casing program with 5 setting points to ensure the subsalt drilling safety in the eastern Sichuan Basin is rational. The successful drilling of Well Wutan 1 provides experiences and references for the follow-up deep-seated gas exploration in the Dazhou-Kaijiang paleo-uplift. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29

Main heading: Subsalt strata

Controlled terms: Creep - Gypsum - Hydrogen sulfide - Infill drilling - Petroleum prospecting - Sulfur compounds - Sulfur determination - Wildcat wells

Uncontrolled terms: Casing program - Paleo-uplift - Pressure system - Salt layers - Sichuan Basin - Ultra-deep wells

Classification code: 481.1 Geology - 482.2 Minerals - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 801 Chemistry - 804.2 Inorganic Compounds - 951 Materials Science

Numerical data indexing: Pressure 1.40e+08Pa, Size 7.57e+03m, Size 8.06e+03m

DOI: 10.3787/j.issn.1000-0976.2018.07.010

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

134. An experimental study on the mass transfer mechanism and the flow regime of gas in nano-scale pores of shale gas reservoirs

Accession number: 20191306691386

Title of translation:

Authors: Liu, Jie (1); Zhang, Yongli (1); Hu, Zhiming (2); Li, Yingjie (3); Yang, Xinle (1)

Author affiliation: (1) School of Mechanics & Engineering, Liaoning Technical University, Fuxin; Liaoning; 123000, China; (2) Institute of Porous Flow and Fluid Mechanics, Chinese Academy of Sciences, Langfang; Hebei; 065007, China; (3) School of Mechanics and Civil Engineering, China University of Mining & Technology, Beijing; 100083, China

Corresponding author: Zhang, Yongli(zyl238@sina.com)

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to explore the mass transfer mode and mechanism and the flow regime of gas in nano-scale pores of shale gas reservoirs and to develop a method for expressing the apparent permeability of shale reasonably, it is necessary to comprehensively analyze the mass transfer mechanism of gas in nano-scale pores of shale gas reservoirs from microscopic and macroscopic perspectives based on previous research results. After gas seepage in tight shale was experimentally studied, the real flow regime of gas in nano-scale pores was analyzed, and the effects of pore size, pressure and other parameters on shale permeability were discussed. Finally, the reasonable expression method of apparent permeability was discussed by comparing different apparent permeability models. And the following research results were obtained. First, the mass transfer mode of free gas in nano-scale pores of shale gas reservoirs is mainly slippage flow, Knudsen diffusion and Fick diffusion, and that of adsorbed gas is mainly surface diffusion. The flow regime of gas is slippage flow or transitional flow without continuous flow. Besides, the smaller the pores and the lower the pressure, the weaker the slippage flow and the stronger the Knudsen diffusion. Second, under the same experimental conditions, the Darcy permeability is the lowest, the Klinkenberg apparent permeability is the medium, and both APF and Wu apparent permeability are the highest. Their curves of APF and Wu apparent permeability alternate. The Beskok-Karniadakis (B-K) apparent permeability and the Civan apparent permeability are very close. Third, in the model of Wu apparent permeability, the slippage flow is the main mass transfer mode of gas in the slippage and transition zones. Fourth, in the model of APF apparent permeability, the slippage flow is the main mass transfer mode of gas in the slippage zone while Knudsen diffusion is the main mass transfer mode in the transition zone. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 26

Main heading: Petroleum reservoir engineering

Controlled terms: Diffusion - Gases - Hydrocarbon seepage - Nanotechnology - Petroleum reservoirs - Pore size - Reservoirs (water) - Shale gas

Uncontrolled terms: Apparent permeabilities - Fick diffusion - Flow regimes - Gas mass - Knudsen diffusion - Nano-scale pores - Slippage flow

Classification code: 441.2 Reservoirs - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 761 Nanotechnology - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.12.010

Compendex references: YES

Database: Compendex

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135. Laboratory experiments on blockage removing and stimulation of CBM reservoirs by composite pulsating fracturing of radial horizontal wells

Accession number: 20185206284682

Title of translation:

Authors: Tian, Shouceng (1); Huang, Zhongwei (1); Li, Gensheng (1); Lu, Peiqing (1); Zhang, Hongyuan (1); Wang, Tianyu (1)

Author affiliation: (1) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing; 102249, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: It is a common phenomenon during CBM drilling and production that reservoir damage is not eliminated completely. In view of this, a technical idea of composite pulsating fracturing of radial horizontal wells which is conducive to blockage removing and stimulation was put forward in this paper. Speaking of the hydraulic jetting in a multi-branch radial well, it is to conduct pulsating hydraulic fracturing moderately through a high-diversion radial hole, so as to crush and break coal beds near the main hole to the uttermost. Thus, an extensive pressure relief and permeability increase area where high-diversion pathways are combined with fracture networks is formed. Then, to verify its technical principles, laboratory tests on pulsating hydraulic fracturing of radial wells were designed and carried out. Besides, the relationships of the features of acoustic emission (AE) response during the formation of fractures by composite fracturing of radial horizontal wells vs. coal breaking degree and macro fracture morphology were experimentally studied by using a pulse servo fatigue testing machine and an acoustic emission detector. And the following research results were obtained. First, under experimental conditions, fractures initially occur when the pressure of composite pulsating hydraulic fracturing of radial horizontal wells is 1/3-1/4 of the peak pressure of conventional fracturing, and the amount of its AE events is 1.38-7.07 times that of conventional fracturing. Second, when composite pulsating hydraulic fracturing of radial horizontal wells is conducted, AE emission signals respond strongly, the peak pressure for macro fracturing is lower and a larger fracture network can be generated more easily under the same condition. Third, radial laterals amount, borehole length, dynamic loading frequency and amplitude are the important factors affecting the effect of composite pulsating hydraulic fracturing of radial horizontal wells. In conclusion, composite pulsating hydraulic fracturing of radial horizontal wells provides a new idea of removing the blockages in CBM reservoirs and developing CBM efficiently, realizing effective blockage removing and stimulation of CBM wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29

Main heading: Acoustic emission testing

Controlled terms: Coal bed methane - Coal deposits - Dynamic loads - Fatigue testing - Fracture - Fracture testing - Horizontal wells - Hydraulic fracturing - Hydraulic machinery - Methane - Natural gas wells - Well stimulation

Uncontrolled terms: Blockage removing - Laboratory test - Radial horizontal wells - Reservoir damage - Stimulation

Classification code: 408.1 Structural Design, General - 503 Mines and Mining, Coal - 512 Petroleum and Related Deposits - 522 Gas Fuels - 632.2 Hydraulic Equipment and Machinery - 751.2 Acoustic Properties of Materials - 804.1 Organic Compounds - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.09.012

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

136. Applicability of working fluid damage assessment methods for coalbed methane reservoirs

Accession number: 20185206284674

Title of translation:

Authors: Zheng, Lihui (1); Li, Xiuyun (2); Su, Guandong (1, 3); Zhao, Wei (1); Gong, Xuguang (1); Tao, Xiujian (1, 4)

Author affiliation: (1) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing; 102249, China; (2) Sinopec Research Institute of Petroleum Engineering, Beijing; 100101, China; (3) Key Laboratory of Comprehensive Research and Application of Chemical Plugging Materials, Chemical Industry and Engineering Society of Hebei, Beijing LihuiLab Energy Technology Co., Ltd., Beijing; 102200, China; (4) Shaanxi University of Science and Technology, Xi'an; Shaanxi; 710021, China

Corresponding author: Su, Guandong(guandong.su@foxmail.com)

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Publisher: Natural Gas Industry Journal Agency

Abstract: Currently, permeability change is a widely-accepted evaluation index for CBM reservoir damage caused by working fluids. There are six common permeability testing methods. However, there have been no reports on the applicability of these methods based on the comparative investigation by means of actual measurement. In this paper, three groups of parallel samples of No.15 coal in the Qinshui Basin were selected randomly. Their permeabilities before and after being damaged by drilling and fracturing fluids were tested in the laboratory using the six methods, i.e., A. constant pressure method, B. constant flowrate method, C. cutting pulse-decay method, D. plunger pulse-decay method, E. pressure oscillation method and F. nuclear magnetic resonance (NMR) method. Then, the average permeabilities before and after reservoir damage and the absolute and the relative reservoir damage were calculated and subsequently processed and analyzed using simple ranking method, element-reduced statistical screening algorithm and test principle analysis method. Finally, the suitable test method was screened out based on the ranking stability of absolute and relative reservoir damages. And the following research results were obtained. First, the absolute reservoir damage rates tested by the methods A & B are higher, those tested by the methods C, D & E are lower, and those tested by the method F are moderate. Second, as for the relative reservoir damage rates tested by the above-mentioned six methods, there is no obviously regular distribution pattern. Third, the application priority of the six permeability measurement methods for CBM reservoir damage evaluation is: $C > B > F > D = E = A$, which is determined by their test mechanisms. In conclusion, the method C is most suitable for testing the damage degree of CBM reservoir matrix, while the method B is for overall damage degree. And it is suitable to apply the methods B & C in parallel to the laboratory evaluation of the CBM reservoir permeability damage degree caused by working fluids. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 31

Main heading: Damage detection

Controlled terms: Algorithms - Coal bed methane - Coal deposits - Cutting fluids - Drilling fluids - Firedamp - Fracturing fluids - Infill drilling - Mechanical permeability - Methane - Nuclear magnetic resonance - Petroleum reservoir evaluation - Testing

Uncontrolled terms: Applicability - Coalbed methane reservoir - Constant-pressure method - Evaluation method - Nuclear magnetic resonance(NMR) - Permeability measurements - Qinshui basin - Reservoir damage

Classification code: 503 Mines and Mining, Coal - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.09.004

Compendex references: YES

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Data Provider: Engineering Village

137. A new quantitative evaluation method for development area selection of tight gas and CBM commingled production

Accession number: 20185206284676

Title of translation:

Authors: Bai, Yuhu (1)

Author affiliation: (1) CNOOC Research Institute, Beijing; 100028, China

Corresponding author: Bai, Yuhu(byh_2002@163.com)

Source title: Natural Gas Industry

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Document type: Journal article (JA)

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Abstract: Existing evaluation methods used for the development area selection of commingled production of tight gas and coalbed methane (CBM) are poorly universal and their parameters (e.g. reserves and reservoir physical properties) cannot reflect the production rate difference during commingled production of tight gas and CBM. In this paper, an integrated evaluation coefficient used for evaluating favorable commingled production areas of tight gas and CBM was defined so as to establish a universal quantitative evaluation index system. Then, by means of orthogonal design together with numerical simulation, the key parameters influencing the commingled production rate and their effect degree on the production rate were determined by taking the commingled production rate as the evaluation target. Finally, a new quantitative evaluation method for the development area selection of commingled production of tight gas and CBM was established. And the following research results were obtained. First, by virtue of the new quantitative evaluation method, the geological occurrence model of tight gas and CBM, the key evaluation parameter and the orthogonal experiment design are established, and the effect degree of evaluation parameters on production rate and the integrated evaluation coefficient of favorable commingled production area of tight gas and CBM are determined. Second, the quantitative evaluation results on the development areas of commingled production of tight gas and CBM in KNW Block based on 12 selected key parameters show that the southern KNW Block and the Well block KNW-37 in the north of KNW Block are the favorable areas for single production of tight gas, Well blocks KNW-10, KNW-33 and KNW-9 are the favorable areas for single production of CBM, and the central and southwestern areas are the favorable areas for the commingled production of tight gas and CBM. In conclusion, this new quantitative evaluation method is universal and can be used as reference for the development area selection of commingled production of tight gas and CBM. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Tight gas

Controlled terms: Coal bed methane - Coal deposits - Firedamp - Methane - Parameter estimation - Petroleum reservoir evaluation - Proven reserves

Uncontrolled terms: Area selection - Favorite area - Ordos Basin - Orthogonal design - Production rates - Quantitative evaluation - Universal

Classification code: 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.09.006

Compendex references: YES

Database: Compendex

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138. Distribution prediction of graphitized organic matter areas in the lower Cambrian Qiongzhusi shale in the Central Sichuan paleo-uplift and its surrounding areas in the Sichuan Basin

Accession number: 20185106260090

Title of translation:

Authors: Jiang, Shan (1); Wang, Yuman (1); Wang, Shuyan (2); Peng, Ping (3); Dong, Dazhong (1, 4); Wu, Wei (3); Li, Xinjing (1); Guan, Quanzhong (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (2) Exploration Division of PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610041, China; (3) Shale Gas Research Center, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (4) National Energy Shale Gas R & D Center, Langfang; Hebei; 065007, China
Corresponding author: Wang, Yuman(wangyuman@petrochina.com.cn)
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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Organic matter graphitization is one of the main reasons for the poor results of shale gas exploration in some areas in China. At present, however, the graphitization degree of organic matter, the lower limit of depth and the main geological reasons for organic matter graphitization are still unclear. In this paper, the Lower Cambrian Qiongzhusi Fm in the central Sichuan paleo-uplift and its surrounding areas were taken as the main research objects. The electric characteristics study of organic matter graphitization were carried out on the Qiongzhusi shale by using resistivity log response and laser Raman spectroscopy. On this basis, the lower depth limit and distribution range of graphitized organic matter were predicted so as to provide a basis for the selection of shale gas exploration areas. And the following research results were obtained. First, The resistivity log of the shale in the high part of Central Sichuan paleo-uplift is normally flat, and there is no G' peak in Raman spectra of organic matter, indicating no organic matter is graphitized. Second, the resistivity of shale below 5 200 m in the Lower Cambrian aulacogen area is low, G' peak occurs in Raman spectra and Ro is over 3. 5%. It is indicated that the organic matter below 5 200 m in this area has been graphitized, but its degree of graphitization is lower than that in the Changning area. Third, the lower depth limit of the graphitization of organic matter varies greatly (4 000-4 600 m) in Weiyuan-Ziyang area, but stays stable (about 5 200 m) in the Moxi-Gaoshiti area. In conclusion, the organic matter in Qiongzhusi Fm shale in the most parts of the Central Sichuan paleo-uplift in the Sichuan Basin has been graphitized, so it is unfavorable for shale gas exploration. In addition, the Weiyuan-Ziyang and Moxi-Gaoshiti areas are non-graphitized areas and they present good prospects of shale gas exploration. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 27

Main heading: Petroleum prospecting

Controlled terms: Biogeochemistry - Biological materials - Electric logging - Gases - Geological surveys - Graphite - Graphitization - Organic compounds - Organic lasers - Raman scattering - Shale gas

Uncontrolled terms: Favorable exploration area - Low resistivity - Lower cambrians - Paleo-uplift - Sichuan Basin

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 741.1 Light/Optics - 744.1 Lasers, General - 802.2 Chemical Reactions - 804.1 Organic Compounds

Numerical data indexing: Percentage 5.00e+00%, Size 4.00e+03m to 4.60e+03m, Size 5.20e+03m

DOI: 10.3787/j.issn.1000-0976.2018.10.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

139. A preliminary design on 35 MPa cylinders made of basalt fiber wound composite for vehicles

Accession number: 20191306691390

Title of translation: , 35 MPa

Authors: He, Taibi (1); Qing, Ping (1); Zeng, Rao (1); Han, Rui (2); Wang, Xia (1); Mao, Dan (3); Yang, Chenxi (1)

Author affiliation: (1) School of Automobile & Transportation, Xihua University, Chengdu; Sichuan; 610039, China; (2) School of Materials Science and Engineering, Xihua University, Chengdu; Sichuan; 610039, China; (3) Chengdu Industry and Trade College, Chengdu; Sichuan; 611730, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to increase the driving range of compressed natural gas (CNG) vehicles, it was proposed to increase the working pressure of CNG cylinders from 20 MPa to 35 MPa in this paper. In addition, a 35 MPa cylinder made of basalt fiber wound composite for vehicles was designed by replacing the traditional carbon and glass fibers with a new type of winding fibers which has high strength, low cost and abundant reserves, i.e. the basalt fiber. Then, the basic structural parameters of composite cylinder lining and filament winding layer were calculated based on the film theory and by the grid analysis method. Finally, the 1/2 cylinder model was developed by using ANSYS Workbench ACP module, and the strength and stability of cylinder under different working conditions were numerically simulated. And the following research results were obtained. First, under the working pressure of 35 MPa, the maximum stress of aluminum alloy lining lies in the changeover portion between the end cap and the cylinder body. The value is 166.19 MPa, which is less than 60% of the yield strength of aluminum alloy lining, i.e. 177.6 MPa. Second, under the blasting pressure of 119 MPa, the maximum stresses of the hoop-winding layer and the spiral-winding layer are 3 742.6 MPa and 3 490.6 MPa respectively, which meet the tensile strength range of basalt reinforced fiber (3 000-4 840 MPa) and satisfy the relevant requirements of DOT-CFFC cylinders made of aluminum alloy lined full-winding composite. Third, this new type of basalt fiber can substitute carbon fiber and glass fiber to wind CNG cylinders, and it can satisfy the pressure requirement of gas cylinders, presenting safety and reliability. In conclusion, it is feasible to increase the working pressure of commonly used CNG cylinders from 20 MPa to 35 MPa. And the research results are conducive to the application and popularization of natural gas vehicles. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Filament winding

Controlled terms: Aluminum alloys - Basalt - Carbon fibers - Composite materials - Compressed natural gas - Computer simulation - Cylinders (shapes) - Glass fibers - Linings - Natural gas vehicles - Numerical methods - Structural design - Tensile strength

Uncontrolled terms: Analysis method - Basalt fiber - CNG cylinders - Composite cylinders - Compressed natural gasses (CNG) - Film theory - Structural parameter - Yield strength of aluminum

Classification code: 408.1 Structural Design, General - 432 Highway Transportation - 522 Gas Fuels - 541.2 Aluminum Alloys - 723.5 Computer Applications - 804 Chemical Products Generally - 812.3 Glass - 816.1 Processing of Plastics and Other Polymers - 921.6 Numerical Methods - 951 Materials Science

Numerical data indexing: Percentage 6.00e+01%, Pressure 1.19e+08Pa, Pressure 1.66e+08Pa, Pressure 1.78e+08Pa, Pressure 2.00e+07Pa to 3.50e+07Pa, Pressure 3.00e+09Pa to 4.84e+09Pa, Pressure 3.50e+07Pa, Pressure 4.91e+08Pa, Pressure 7.43e+08Pa

DOI: 10.3787/j.issn.1000-0976.2018.12.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

140. Numerical simulation on multi-stage fractured horizontal wells in shale gas reservoirs based on the finite volume method

Accession number: 20191306691385

Title of translation:

Authors: Chen, Xiaofan (1); Tang, Chao (1); Du, Zhimin (1); Tang, Liandong (1); Wei, Jiabao (2); Ma, Xu (3)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Hekou Oil Production Plant, Sinopec Shengli Oilfield Company, Dongying; Shandong; 257015, China; (3) No.5 Gas Production Plant, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710000, China

Corresponding author: Tang, Chao(201511000111@stu.swpu.edu.cn)

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Document type: Journal article (JA)

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Abstract: In order to simulate the flowing of shale gas in multi-scale media, we established a mathematical model for the unsteady seepage of multi-stage fractured horizontal wells in shale gas reservoirs in consideration of the flowing characteristics of shale gas in matrix, natural fractures and large-scale artificial fractures. Grid division in the simulation region was carried out by means of nonstructural tetrahedral grid. Then, a 3D numerical model for the seepage of shale gas was established discretely using finite volume method and solved using sequence solution method. Finally, the production performance of multi-stage fractured horizontal wells in shale gas reservoirs and the reservoir pressure distribution were simulated, and the simulation results were analyzed. And the following research results were obtained. First, the gas production rates of multi-stage fractured horizontal wells calculated by this newly established numerical simulation method are basically consistent with the calculation results by the commercial numerical simulation software Eclipse, which proves that this new model is accurate and feasible. Second, the gas production rates of horizontal wells calculated by the sequential solution method are different from those calculated by the fully implicit solution method in the early production stages, but as the calculation progresses, both of them tend to be consistent, which further verifies the accuracy of this new model. Third, desorbed gas plays a supplementary role to reservoir pressure, but its function is limited, and its effect on gas production is little. As the production goes on, the percentage of desorbed gas increases gradually. Fourth, the key to the stimulation of shale-gas horizontal wells is to determine the number of fractured sections rationally and create longer artificial fractures. In conclusion, the research results are conducive to the design of stimulated reservoir volumes (SRVs) of shale gas reservoirs and the prediction of production performance of multi-stage fractured horizontal wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 32

Main heading: Natural gas wells

Controlled terms: 3D modeling - Computer software - Desorption - Finite volume method - Fracture - Gases - Horizontal wells - Hydrocarbon seepage - Numerical methods - Numerical models - Petroleum reservoirs - Shale gas - Well stimulation

Uncontrolled terms: 3-D numerical modeling - 3-D numerical simulation - Fractured horizontal wells - Gas productions - Implicit solutions - Numerical simulation method - Numerical simulation software - Stimulated reservoir volumes

Classification code: 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 723 Computer Software, Data Handling and Applications - 802.3 Chemical Operations - 921 Mathematics - 921.6 Numerical Methods - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.12.009

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

141. A stimulated reservoir volume (SRV) evaluation model and its application to shale gas well productivity enhancement

Accession number: 20185006230372

Title of translation:

Authors: Ren, Lan (1); Lin, Ran (1); Zhao, Jinzhou (1); Rong, Mang (2); Chen, Jianda (2)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Research Institute of Petroleum Engineering, Sinopec Jiangnan Oilfield Company, Wuhan; Hubei; 430000, China

Corresponding author: Lin, Ran(bob_home@126.com)

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: At present, existing evaluation methods for stimulated reservoir volume (SRV) of hydraulic fracturing mainly include microseismic monitoring method, tiltmeter measurement method and mathematical model calculation method. However, the direct measurement methods have the defects of high cost and poor repeatability. And if the theoretical model is used to calculate SRV, the calculation cost can be reduced, the calculation speed can be increased and the accuracy and reliability of calculation results can be improved. In this paper, the restrictions of existing SRV evaluation models were analyzed. Then, based on the fracture propagation theory of horizontal well multistage and multicluster fracturing, the rock mechanics theory and the seepage mechanics theory, the inducing and damage mechanisms to the natural fractures in shale by the simultaneous change of fluid diffusion seepage field and fracture induced stress field in fracture propagation by horizontal well multistage and multicluster fracturing were studied, and a SRV numerical evaluation model (hereinafter "new model" for short) was established correspondingly. Based on this, the propagation behavior of fracture cluster, the change of induced stress field of hydraulic fracture, the uplift of reservoir pressure field of hydraulic fracturing and the extension of natural fracture damage area were numerically simulated and characterized, and the total stimulated reservoir volume was calculated. Finally, this new model was applied and verified on site at Well X1-HF in the Fuling National Shale Gas Demonstration Area. And the following research results were obtained. First, the calculation method of this new model is consistent with the actual physical evolution mechanism of reservoir SRV in shale fracturing, so it can calculate SRV more accurately and characterize it quantitatively. Second, the SRV simulation result of this new model is line with the field microseismic monitoring result. Third, the SRV contributed by the horizontal well multistage fracturing in the demonstration area can satisfy the requirement of efficient shale gas development and its stimulation effect is remarkable. In conclusion, this new model is of high accuracy and reliability, and it can be used to guide the fracturing design optimization of shale gas fracture network, well spacing adjustment and infill well deployment in the later development stage of the Fuling National Shale Gas Demonstration Area, so it is worth popularizing and applying extensively. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 49

Main heading: Well spacing

Controlled terms: Demonstrations - Fracture - Gases - Horizontal wells - Hydraulic fracturing - Hydrocarbon seepage - Infill drilling - Mechanisms - Microseismic monitoring - Natural gas well production - Petroleum reservoir evaluation - Rock mechanics - Seismology - Shale gas - Stresses - Well stimulation

Uncontrolled terms: Evaluation modeling - Fuling National Shale Gas Demonstration Area - Induced stress - Seepage mechanics - Stimulated reservoir volumes

Classification code: 483.1 Soils and Soil Mechanics - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 601.3 Mechanisms - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.08.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

142. Analysis and calibration of false buried structures at the footwall of foreland thrust belt: A case study on "Huobei buried structure" in the eastern Junggar Basin

Accession number: 20185006230368

Title of translation: -""

Authors: Huang, Yun (1); Liang, Shuyi (2); Gao, Xinfeng (1); Gao, Ming (1); Fu, Xiaopeng (1)

Author affiliation: (1) Research Institute of Exploration & Development, PetroChina Xinjiang Oilfield Company, Karamay; Xinjiang; 834000, China; (2) School of Geoscience, China University of Petroleum-East China, Qingdao; Shandong; 266580, China

Source title: Natural Gas Industry

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Volume: 38**Issue:** 8**Issue date:** August 25, 2018**Publication year:** 2018**Pages:** 16-22**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: The foreland thrust belts between orogenic zones and basins and the buried structures at their footwalls are important oil & gas exploration fields. The studies on structural illusions and complex structures in time domain usually focus on the structural illusions that the images of the underlying structures are pulled up or down by the violent change of stratum thickness or special landforms (e.g. highspeed salt dome and submarine canyons). However, the effects of the thickness change and pinchout of volcanic rock matrix on the imaging of footwall structures and the "false fault and false structure" identification methods are rarely researched. In this paper, the buried anticline at the footwall of Carboniferous Kelameili foreland thrust belt to the north of Huoshaoshan Oilfield in the northeastern Junggar Basin (hereinafter "Huobei buried structure" for short) was taken as an example. Firstly, the verification process before and after the drilling of Well HB2 was described. Then, based on the comprehensive analysis of forward modeling, pre-stack depth migration section and diplog, the cause for "false anticline and false fault" at the footwall of Kelameili foreland thrust belt in time domain was discussed. And the following research results were obtained. First, the lateral change of formation velocity can lead to distorted structural forms of the underlying strata in the velocity anomaly zones, and consequently false structure and deviated structural high emerge. Second, Huobei buried structure and Well H14 north fault are the structural illusions which are resulted from the high-velocity layer of Carboniferous volcanics at the hanging wall of thrust fault and the abrupt change of lateral thickness. Third, the pre-stack depth migration technology (PSDM) is the best tool for solving the problem of structure illusion in time-domain section. If PSDM cannot work, the structural map can be obtained by establishing a correct 3D velocity field and conducting variable velocity time-depth conversion. In conclusion, whether the complex structural belt of overthrust nappe fault is true or not can be discriminated by establishing the typical structural pattern and seismic structure interpretation model of complex structure area and applying forward modeling, combined with diplog results. In addition, the discussion on the seismic interpretation technologies used for overthrust nappe faulting zones with developed volcanics is of practical significance to the selection of exploration targets in the study area, and it can be used as the reference for the seismic data interpretation of similar areas as well. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 22**Main heading:** Time domain analysis**Controlled terms:** Faulting - Landforms - Petroleum prospecting - Seismology - Velocity**Uncontrolled terms:** Buried structure - Carboniferous - Depth-domain section - Diplog - Foreland thrust belt - Forward modeling - Junggar Basin - Volcanics**Classification code:** 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 512.1.2 Petroleum Deposits : Development Operations - 921 Mathematics**DOI:** 10.3787/j.issn.1000-0976.2018.08.003**Compendex references:** YES**Database:** Compendex

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Data Provider: Engineering Village

143. Application of elemental capture spectroscopy logging in hydrate reservoir evaluation in the Shenhu sea area

Accession number: 20191306691382**Title of translation:****Authors:** Kang, Dongju (1); Liang, Jinqiang (1); Kuang, Zenggui (1); Lu, Jing'an (1); Guo, Yiqun (1); Liang, Jin (1); Cai, Huimin (2); Qu, Changwei (2)**Author affiliation:** (1) Guangzhou Marine Geological Survey, China Geological Survey, Guangzhou; Guangdong; 510760, China; (2) Schlumberger China Petroleum Institute, Beijing; 100015, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 12**Issue date:** December 25, 2018

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ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the hydrate drilling process of Well W18 during GBGS-3 sequence of voyages in the Shenhu sea area, the northern South China Sea, the logging while drilling (LWD) shows that the gamma values of upper hydrate reservoirs and the intervals above them are obviously low. According to the core testing results, however, the quartz content of low-gamma intervals doesn't increase significantly. And the carbonate content and lithologic features of formation rocks cannot be figured out by virtue of conventional logging methods, so no correct interpretation can be provided. In this paper, the principle of elementary capture spectroscopy(ECS)logging was analyzed. Then, the mineral component determined based on the ECS logging data of Well W18 was taken as the input of ElanPlus logging processing, and combined with other conventional logging data, the mineral component of related strata was identified accurately, and accordingly the lithologic section of Well W18 was determined. Finally, the hydrate porosity, hydrate saturation and matrix permeability in Well W18 were calculated by two methods, i.e., the density log and the ECS logging process which takes the mineral component content as the response parameter. And the following research results were obtained. First, the low-gamma intervals in Well W18 are generated by the increase of calcite content instead of sandy components. Second, the hydrate porosity acquired by these two methods is generally consistent, but the result by the latter method fits better with the core analysis results. In conclusion, the ECS logging provides a new technique and method for the comprehensive evaluation of hydrate reservoirs and improves the coincidence rates of the logging interpretation of hydrate reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 42

Main heading: Petroleum reservoir evaluation

Controlled terms: Calcite - Gas hydrates - Hydration - Infill drilling - Porosity - Radioactivity logging

Uncontrolled terms: Elemental capture spectroscopy - Low-gamma - Mineral component - Northern South China Sea - Sea areas

Classification code: 481.4 Geophysical Prospecting - 482.2 Minerals - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.12.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

144. Characteristics of coal measure gas accumulation and such gas exploration strategies in China

Accession number: 20183805830740

Authors: Ouyang, Yonglin (1); Tian, Wenguang (1); Sun, Bin (1); Wang, Bo (2); Qi, Ling (1); Sun, Qiping (1); Yang, Qing (1); Dong, Haichao (3)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) National Institute for Occupational Safety, State Administration of Work Safety, Beijing; 100713, China; (3) PetroChina Coalbed Methane Company Limited, Beijing; 100013, China

Corresponding author: Tian, Wenguang(tianwg69@petrochina.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Pages: 15-23

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Coal measure gas is broadly defined as all natural gas occurring in coal measure strata while narrowly defined as the coalbed methane (CBM) in coal beds and the natural gas in the adjacent tight sandstone reservoirs. In this paper, the hydrocarbon accumulation characteristics and control factors of narrowly defined coal measure gas in China were analyzed from the aspects of source rock distribution, coal-sandstone combination type, sedimentary facies and closed system to improve CBM development benefit. And the following research results were obtained. First, there are various coal-sandstone combination relationships in coal measure strata of coal bearing basins in China. Second, the widely-distributed source rocks provide sufficient gas sources for the enrichment of coal measure gas. Third, sedimentary facies dominate the combination relationships of source-reservoir-caprock assemblages of coal measure gas, so the inborn material base of coal measure gas accumulation is formed. The sedimentary systems of fluvial facies and delta facies are the most favorable sedimentary facies for the paragenesis and accumulation of coal measure gas for their coal beds and sandstones are developed. Fourth, the closed system controls the whole process of generation, enrichment and accumulation of CBM (coal measure gas). Three types of coal measure gas reservoirs are identified: self-source and self-reservoir CBM reservoirs, paragenetic CBM-sandstone gas reservoirs, coal-derived sandstone gas reservoirs, among which the first type is currently the main target of CBM exploration and development. Finally, the next exploration direction of coal measure gas was pointed out as follows. First, the exploration and evaluation of coal measure gas shall be focused on the giant basins with abundant coal measure gas, such as Qinshui, Ordos, Junggar, Hailar and Jixi. Second, coal measure gas reservoirs shall be explored specifically based on different types. It is necessary to carry out CBM exploration in the self-source and self-reservoir CBM enriched zones in the shallow layers, integrated exploration of CBM and sandstone gas in the paragenetic CBM-sandstone gas reservoirs in the deep layers, and sandstone gas exploration in coal-derived sandstone gas reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 28

Main heading: Petroleum prospecting

Controlled terms: Coal - Coal bed methane - Coal deposits - Firedamp - Geological surveys - Methane - Natural gas - Petroleum reservoirs - Sandstone - Sedimentology - Tight gas

Uncontrolled terms: China - Closed systems - Control factors - Exploration and development - Hydrocarbon accumulation characteristics - Tight sandstone gas

Classification code: 481.1 Geology - 482.2 Minerals - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 524 Solid Fuels - 804.1 Organic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.03.002

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

145. An energy measurement method for multi-source natural gas distribution pipeline networks

Accession number: 20182905565479

Authors: Xu, Xiaoxuan (1); Li, Qi (1); Jing, Dong (2)

Author affiliation: (1) Sinopec Exploration & Production Research Institute, Beijing; 100083, China; (2) New Century Machinery Manufacturing Company of CNPC Bohai Equipment Manufacturing Co., Ltd., Tianjin; 300280, China

Corresponding author: Li, Qi(liqi2012.syky@sinopec.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

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Issue date: January 25, 2018

Publication year: 2018

Pages: 116-122

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 15

Main heading: Flowmeters

Controlled terms: Directed graphs - Electric power measurement - Flow measurement - Gas supply - Gases - Measurement errors - Pipelines - Topology - Volume measurement

Uncontrolled terms: Assignment method - Measurement technologies - Operation procedure - Operational procedures - Pipeline networks - State reconstruction - Technical requirement - Topological structure

Classification code: 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 921.4 Combinatorial Mathematics, Includes Graph Theory, Set Theory - 942.2 Electric Variables Measurements - 943.1 Mechanical Instruments - 943.2 Mechanical Variables Measurements

Numerical data indexing: Percentage 5.00e-01%, Percentage 8.00e+00%

DOI: 10.3787/j.issn.1000-0976.2018.01.015

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

146. Potential of continental shale gas accumulation in medium-and small-sized fault basins in eastern China: A case study from the Fuxin Basin

Accession number: 20183905863711

Authors: Zhao, Qun (1, 2); Wang, Hongyan (1, 2); Yang, Shen (1); Zang, Huanrong (1, 2); Liu, Dexun (1, 2); Sun, Qiping (1); Jiang, Xinchun (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Langfang; Hebei; 065007, China; (2) National Energy Shale Gas R&D Centre, Langfang; Hebei; 065007, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 5

Issue date: May 25, 2018

Publication year: 2018

Pages: 26-33

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: A great number of Mesozoic medium- and small-sized fault basins are developed in eastern China. In these fault basins, the sedimentary thickness of continental organic-rich shale is great, and the Cretaceous volcanic activities accelerate the maturity of organic matters in the shale, which provide favorable prerequisites for shale gas accumulation. In this paper, the potential of continental shale gas accumulation in the mentioned Mesozoic medium- and small-sized fault basins was analyzed with the Fuxin Basin as an example. Based on the latest drilling, core and cutting test data, six elements of shale gas accumulation in organic-rich shale in the Fuxin Basin were discussed, including thickness, distribution, total organic carbon (TOC) content, thermal evolution maturity of organic matter (Ro), reservoir capacity and compressibility. Then, depending on the characteristics of shale reservoirs, the potential of continental shale gas accumulation in the study area was investigated, and the suggestions on further exploration and development were proposed. The following results were obtained. First, continental shale in the medium- and small-sized fault basins in eastern China is characterized by great total reservoir thickness, high TOC content and moderate thermal maturity, which are advantageous for shale gas accumulation, while larger lateral thickness variation, lower reservoir capacity and weaker stimulation feasibility, which are disadvantageous for shale gas accumulation. Second, continental shale has high TOC content (averagely 5.4%), and high Ro (>1.2%) under the effect of Mesozoic volcanic activities, suggesting a gas generating window, so there is a superior material basis for shale gas accumulation. Third, it is uncertain whether the multi-stage fracturing technique of horizontal wells for the development of marine shale gas is applicable to the development of continental shale gas, so it is necessary to develop the 3D vertical multi-layer development technique of vertical wells suitable for continental shale gas. Fourth, the single-well production rate of continental shale gas is lower than that of marine shale gas, so it is necessary to strengthen the single-well economic productivity evaluation of continental shale gas in fault basins. In conclusion, the fault basins in eastern China are mostly similar to the Fuxin Basin and they have the material basis for shale gas accumulation, so these basins are the new targets for achieving breakthroughs in continental shale gas exploration. Further exploration shall focus on the identification of zones with a high reservoir capacity and of intervals with strong simulation feasibility. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Petroleum prospecting

Controlled terms: Biogeochemistry - Biological materials - Gases - Geological surveys - Horizontal wells - Organic carbon - Petroleum reservoir evaluation - Shale gas - Volcanoes

Uncontrolled terms: Eastern China - Fault basin - Fuxin Basin - Gas accumulation - maturity - Shale thickness - Thermal evolution - Vertical wells

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 484 Seismology - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds

Numerical data indexing: Percentage 5.40e+00%

DOI: 10.3787/j.issn.1000-0976.2018.05.003

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

147. Preparation and properties of W/O microemulsified acid preflush

Accession number: 20182905565434

Authors: Peng, Zhigang (1); Zhong, Mingjing (1); Feng, Qian (1); Huo, Jinhua (1); Luo, Wenjia (1); Liu, Gaofeng (1); Zhang, Bojian (1)

Author affiliation: (1) College of Chemistry and Chemical Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

Corresponding author: Feng, Qian(529468317@qq.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 83-89

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 25

Main heading: Phase interfaces

Controlled terms: Brownian movement - Cementing (shafts) - Contact angle - Corrosion - Drilling fluids - Efficiency - Horizontal wells - Infill drilling - Microemulsions - Nuclear magnetic resonance - Particle size - Particle size analysis - Polyethylene oxides - Relaxation time - Soils - Surface active agents - Wetting

Uncontrolled terms: Cementing quality - Displacement efficiency - Interface wettabilities - Low field nuclear magnetic resonance - Oil-based drilling fluid - Polyoxyethylene ether - Preflush - Quaternary ammonium salt

Classification code: 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 801.3 Colloid Chemistry - 801.4 Physical Chemistry - 803 Chemical Agents and Basic Industrial Chemicals - 804 Chemical Products Generally - 815.1.1 Organic Polymers - 913.1 Production Engineering - 931 Classical Physics; Quantum Theory; Relativity - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Percentage 9.69e+01%, Size 2.12e-08m

DOI: 10.3787/j.issn.1000-0976.2018.02.011

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

148. Trenchless installation, rehabilitation and replacement technologies for natural gas pipelines abroad

Accession number: 20183805830752

Authors: Lu, Hongfang (1, 2); Wu, Xiaonan (3); Iseley, Tom (2); Matthews, John (2); Peng, Shanbi (3)

Author affiliation: (1) School of Petroleum Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) Trenchless Technology Center, Louisiana Tech University, Ruston; LA; 71270, United States; (3) School of Civil Engineering and Architecture, Southwest Petroleum University, Chengdu; Sichuan; 610500, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 3**Issue date:** March 25, 2018**Publication year:** 2018**Pages:** 110-120**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency**Number of references:** 25**Main heading:** Trenching**Controlled terms:** Gases - High pressure engineering - High pressure pipelines - Installation - Natural gas - Natural gas pipelines - Patient rehabilitation - Quality control - Structural integrity**Uncontrolled terms:** Abroad - China - Development directions - Pipeline integrity management - Replacement - Trenchless technologies**Classification code:** 408 Structural Design - 461.5 Rehabilitation Engineering and Assistive Technology - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 913.3 Quality Assurance and Control**DOI:** 10.3787/j.issn.1000-0976.2018.03.014**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

149. Effect of cross-section distortion on the performance of small-radius hot-bending bends

Accession number: 20183905879918**Authors:** Wang, Gaofeng (1, 2); Yang, Zhuanzhao (1, 2); Liu, Yinglai (1, 2); Zhao, Jinlan (1, 2)**Author affiliation:** (1) CNPC Tubular Goods Research Institute, Xi'an; Shanxi; 710077, China; (2) State Key Laboratory of Performance and Structural Safety for Petroleum Tubular Goods and Equipment Materials, Xi'an; Shanxi; 710077, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 6**Issue date:** June 25, 2018**Publication year:** 2018**Pages:** 121-127**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: While a small radius hot-bending bend is manufactured, various cross-section distortions may occur, such as out of roundness of cross section, and wall thickness reduction or increase. And these defects may deteriorate the bearing capacity of pipelines. In order to study the effect of cross-section distortion on the performance of small radius hot-bending bends, 3D (D refers to pipe diameter) hot-bending bends were manufactured based on different combinations of process parameters. Then, the cross-section distortion, structure properties and their correlation of 3D bends and conventional 5D bends were analyzed comprehensively by means of cross-section geometry analysis, distortion analysis, physical and chemical property test, micro-structural analysis and so on. And the following research results were obtained. First, the wall thickening/thinning rate of 3D bends is about 2 times that of 5D bends, and the roundness of 3D bends is about 2–4 times that of 5D bends. Second, the cross-section distortion of 3D bends is obvious, so its heating temperature varies greatly in different parts, leading to different structure morphologies and contents. As a result, the numerical distribution of mechanical properties of each part of 3D bends (e.g. intrados, extrados and neutral zone) is discrete. Third, the strength at the intrados of most bends doesn't meet the standard, and it is sorted from the higher to the lower as extrados, neutral zone and intrados while the sequence of Charpy impact toughness is right contrary to the strength. Fourth, the strength at intrados and extrados decreases with the increase of roundness. The strength at intrados decreases with the increase of thickening rates. And the strength at extrados increases with the increase of thinning rates. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Pipeline bends

Controlled terms: Bending strength - Chemical analysis - Metal forming machines

Uncontrolled terms: Cross section distortion - Extradados - Hot bending - Induction coils - Intrados - Neutral zone - Roundness - Strength

Classification code: 535.2.1 Metal Forming Machines - 619.1 Pipe, Piping and Pipelines

DOI: 10.3787/j.issn.1000-0976.2018.06.016

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

150. The permian source rocks in the sichuan basin and its natural gas exploration potential (part 2):geochemical characteristics of source rocks and latent capacity of natural gas resources

Accession number: 20183905879907

Authors: Chen, Jianping (1, 2, 3); Li, Wei (1, 2); Ni, Yunyan (1, 2, 3); Dai, Xin (4); Liang, Digang (1, 2, 3); Deng, Chunping (1, 2, 3); Bian, Lizeng (5)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) State Key Laboratory of Enhanced Oil Recovery, Beijing; 100083, China; (3) CNPC Key Laboratory of Petroleum Geochemistry, Beijing; 100083, China; (4) PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (5) School of Earth Sciences and Engineering, Nanjing University, Nanjing; Jiangsu; 210093, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 33-45

Language: Chinese

ISSN: 10000976

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: There are two sets of source rocks in the Permian of the Sichuan Basin, i.e., the Middle Permian marine carbonate rocks and the Upper Permian transitional clastic rocks. Since the Permian source rocks are currently at the over-mature stage, there is no clear understanding of their original hydrocarbon generation potential and natural gas resource potential. In this paper, the geochemical characteristics and the relationship between hydrocarbon generation potential and maturity of abundant Permian source rock samples taken from the exploration wells in the Sichuan Basin and its peripheral sections were investigated. Then, the original hydrocarbon generation potential of Permian source rocks, the hydrocarbon generation and expulsion during geological history and the resource potential of natural gas from kerogen and crude oil cracking were discussed. And the following research results were obtained. First, mudstone and carbonaceous mudstone in the Upper Permian Longtan Fm are characterized by high organic matter abundance and great hydrocarbon generation potential, and they are the most important source rocks in the Permian. Coal in the Longtan Fm is also very important gas source rocks. The Dalong Fm of Upper Permian is also very high in TOC and hydrocarbon generation potential, and it is the important source rock in the northern part of the basin. While the Middle Permian carbonate source rocks are the secondary source rocks with low organic matter abundance and initial hydrocarbon generation potential. Second, the Permian source rocks generated 3.290×10^8 t crude oil and 4.20×10^{12} m³ natural gas during the geological history, in which the contribution of Longtan Fm source rocks to crude oil and natural gas is 80% and 85%, respectively. Third, the crude oil resources of paleo-oil reservoirs derived from the Permian source rocks are as high as 5.80×10^8 t, and the total natural gas resources are up to 6.55×10^{12} m³, including 4.45×10^{12} m³ (70%) oil-cracking gas and 2.10×10^{12} m³ natural gas directly generated from kerogen. It is concluded that the northern and central-southeastern parts of the basin are the two hydrocarbon generation centers of the Permian and they are the favorable areas of Permian hydrocarbon accumulation and natural gas exploration. Moreover, the paleo-oil reservoirs in these two areas are the most prospective targets for natural gas exploration in the Sichuan Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 40

Main heading: Petroleum prospecting

Controlled terms: Biogeochemistry - Biological materials - Crude oil - Exploratory geochemistry - Gases - Geological surveys - Geology - Hydrocarbons - Kerogen - Natural gas - Natural gas deposits - Oil shale - Petroleum reservoir engineering - Petroleum reservoirs - Sedimentary rocks
Uncontrolled terms: Favorable exploration area - Hydrocarbon generation potential - Organic matter abundances - Permian - Resource - Resource potentials - Sichuan Basin - Source rocks
Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals - 512 Petroleum and Related Deposits - 522 Gas Fuels - 804.1 Organic Compounds
Numerical data indexing: Percentage 7.00e+01%, Percentage 8.00e+01%, Percentage 8.50e+01%
DOI: 10.3787/j.issn.1000-0976.2018.06.005
Compendex references: YES
Database: Compendex
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Data Provider: Engineering Village

151. Quantitative risk assessment of the natural gas pipelines in upgraded areas

Accession number: 20182905565438
Authors: Zhou, Yawei (1); Zhang, Zhenyong (1); Tian, Shanshan (1)
Author affiliation: (1) China Petroleum Pipeline Engineering Co., Ltd. , Langfang; Hebei; 065000, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: February 25, 2018
Publication year: 2018
Pages: 112-118
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Number of references: 27
Main heading: Risk assessment
Controlled terms: Gases - Location - Natural gas - Natural gas pipelines - Reliability
Uncontrolled terms: High consequence areas - Individual risks - Quantitative risk assessment - Risk acceptance criteria - Risk controls - Social risks
Classification code: 522 Gas Fuels - 914.1 Accidents and Accident Prevention
DOI: 10.3787/j.issn.1000-0976.2018.02.015
Compendex references: YES
Database: Compendex
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Data Provider: Engineering Village

152. Latest research progresses in network fracturing theories and technologies for shale gas reservoirs

Accession number: 20183805830739
Authors: Zhao, Jinzhou (1); Ren, Lan (1); Shen, Cheng (1); Li, Yongming (1)
Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation/Southwest Petroleum University, Chengdu; Sichuan; 610500, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
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Issue date: March 25, 2018
Publication year: 2018
Pages: 1-14
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In view of the bottleneck of shale gas development technologies, the latest progresses in such theories on the fields like fracture network fracability evaluation, fracture network propagation mechanism, stimulated reservoir volume (SRV) evaluation and fracturing fluid research & development were analyzed comprehensively in reference to the existing achievements and experiences in North American shale gas reservoir development and based on the probes, practices and cognitions of shale gas development technologies in China since 2005. First, the study on the shale brittleness develops from the definition of mineral and mechanical semi-quantitative threshold measurement to a comprehensive evaluation which integrates rock constituents, elastic mechanics and development characteristics of natural fractures together. Second, the study on the fracture network development develops from the directional extension theory to the simulation of fracture network formation in the stochastic distribution pattern of natural fractures. Third, the study on SRV develops from the micro-seismic monitoring based instrument and technology to the mathematical theory evaluation method dependent on the discrete fracture network and extended finite element. And fourth, the study on fracturing fluids develops from the wide application of slick water (drag reducing water) and a linear gel fracturing fluid system to the development and application of novel fracturing fluids with little or no water. Then, the theoretical and technological challenges were pointed out, including the comprehensive fracability evaluation of reservoir fracture networks, the deep seated shale gas fracturing, the operation curve diagnosis of shale gas fracturing, the shale gas refracturing theory, and the research & development and flowback control of novel fracturing fluids. Finally, the development trend of related technologies was predicted so as to provide a theoretical and technical guidance for the efficient shale gas development in China in the future. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 63

Main heading: Fracturing fluids

Controlled terms: Drag reduction - Fracture mechanics - Gases - Hydraulic fracturing - Minerals - Petroleum reservoir evaluation - Petroleum reservoirs - Reservoirs (water) - Shale gas - Stochastic systems

Uncontrolled terms: China - Development and applications - Development characteristics - Discrete fracture network - Extended finite elements - Fracability - Fracture network - Stimulated reservoir volumes

Classification code: 441.2 Reservoirs - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 931.1 Mechanics - 961 Systems Science

DOI: 10.3787/j.issn.1000-0976.2018.03.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

153. New understandings of the seismic modes of high productivity wells in the Sinian Dengying Fm gas reservoirs in the Gaoshiti area, Sichuan Basin

Accession number: 20182905565425

Authors: Xiao, Fusen (1); Chen, Kang (1); Ran, Qi (1); Zhang, Xuan (1); Xie, Bing (1); Liu, Xinggang (1); Xu, Wei (1); Luo, Wenjun (1)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610041, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: February 25, 2018

Publication year: 2018

Pages: 8-15

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Sinian Dengying Fm in the Sichuan Basin is a set of fractured-vuggy reservoirs mainly dominated by sedimentation and karstification, and characterized by small fractures and vugs, complex stratigraphy and lithology, and strong vertical and lateral reservoir heterogeneity. As a result, the drilling rates are lower and single-well gas productivity varies greatly there. And the reservoir identification results based on seismic data in this area are ambiguous. In view of this, the Deng 4 Member in the Gaoshiti buried structure on the southern flank of the Leshan-Longnüsi palaeohigh was precisely divided in stratigraphy. Then, the types of reservoir assemblages were determined

based on gas well logging and test data, and the seismic response characteristics of typical wells with different types of reservoir assemblages and the seismic modes of high productivity wells were studied by using high-resolution seismic data. It is indicated that the Deng 4 Member in this area is divided into three types of reservoir assemblages, which correspond to three seismic modes. Seismic mode I: It presents the seismic response characteristics of "wide wave troughs + double highlights" or "wide wave troughs + complex waves", indicating that fractures and vugs are developed. It is the preferred seismic mode of high productivity wells in the stage of development. In this mode, the technology of highly deviated wells or horizontal wells can be implemented. Seismic mode II: It presents the seismic response characteristics of "wide wave troughs", indicating that fractures and vugs are relatively developed. It is the mode of moderate productivity wells. In this mode, the technology of highly deviated wells can be implemented. Seismic mode III: It presents the seismic response characteristics of "wide wave troughs + highlights", indicating that fractures and vugs are underdeveloped. It is mode of low productivity wells, in which the technology of horizontal wells can be implemented. The new understandings on seismic modes were applied on site. It is shown that the reservoir drilling rate is over 60% and the average gas production rate during the production test of 8 wells is up to 75.34×104 m³/d. It is concluded that the seismic mode of high productivity wells based on seismic facies, fracture and vug prediction and integrated target design provides a support for the well arrangement and drilling trajectory adjustment in natural gas exploration and development in the Gaoshiti area and good results have been achieved. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Natural gas wells

Controlled terms: Deflected boreholes - Fracture - Gases - Geophysical prospecting - Horizontal wells - Infill drilling - Lithology - Natural gas well production - Petroleum prospecting - Petroleum reservoirs - Productivity - Seismic design - Seismic response - Seismic waves - Stratigraphy - Well logging

Uncontrolled terms: Dengying formation - Fractured-vuggy reservoirs - Gaoshiti area - High productivity well - Karst - Sichuan Basin - Sinian

Classification code: 408 Structural Design - 481.1 Geology - 481.4 Geophysical Prospecting - 484 Seismology - 484.2 Secondary Earthquake Effects - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 951 Materials Science

Numerical data indexing: Percentage 6.00e+01%

DOI: 10.3787/j.issn.1000-0976.2018.02.002

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

154. Drainage gas recovery technology based on canned ESP system of high-sulfur gas Wells

Accession number: 20182905565432

Authors: Peng, Yang (1); Ye, Changqing (1); Sun, Fengjing (1); Wang, Xueqiang (1); Zhu, Peng (1); Zhu, Qing (2); Zhang, Yu (2); Wang, Weilin (1)

Author affiliation: (1) Engineering Technology Research Institute, PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610031, China; (2) Shunan Division of PetroChina Southwest Oil and Gas Field Company, Luzhou; Sichuan; 646000, China

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Publisher: Natural Gas Industry Journal Agency

Abstract: In order to apply the electric submersible pump (ESP) based drainage gas recovery technology that is commonly used in conventional gas wells to high-sulfur gas wells, and meet the requirements on casing protection of high-sulfur gas wells, we conducted a series of technical researches on casing protection, gas interference and vibration of deep-well ESP set in terms of a completion string design and support tools based on the completion modes of high-sulfur gas wells and the technical characteristics of ESP drainage gas recovery technologies. And the research

results were used in the design of Well L2 drainage gas recovery. The following research results were obtained. First, the completion string system of high-sulfur gas wells is developed with a canned ESP system as the main part, combined with the anchor intubation packer. By virtue of this system, the normal operation of ESP is guaranteed and the requirements on casing protection are satisfied. Second, gas interference can be dealt with using multi-phase pump and gas venting pipes, the effect of an ESP complex flow path on the gas flowing of gas wells can be diminished by means of an automatic reverse valve, and the string vibration can be reduced using an intubation packer equipped with an anchor mechanism. Third, the canned ESP system designed in this paper is applicable to $\varnothing 244.5$ mm and $\varnothing 177.8$ mm casings. And the ESP corresponding to $\varnothing 244.5$ mm casing has the maximum flow rate of 900 m³/d and the maximum lift height of 4 500 m, and that corresponding to $\varnothing 177.8$ mm casing has the maximum flow rate of 300 m³/d and the maximum lift height of 3 000 m. It is concluded that this research result provides a technical support for the implementation of ESP based drainage gas recovery technology in high-sulfur gas wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Natural gas well completion

Controlled terms: Electric tools - Gases - Lift - Natural gas wells - Oil well casings - Packers - Recovery - Submersible pumps - Submersibles - Sulfur

Uncontrolled terms: Canned system - Casing protection - Drainage gas recovery - Electric submersible pumps - High sulfur gas wells - Well completion methods

Classification code: 511.2 Oil Field Equipment - 512.2.1 Natural Gas Fields - 512.2.2 Natural Gas Deposits: Development Operations - 618.2 Pumps - 651.1 Aerodynamics, General - 674.1 Small Marine Craft - 704.2 Electric Equipment - 804 Chemical Products Generally

Numerical data indexing: Size 3.00e+03m, Size 4.50e+03m

DOI: 10.3787/j.issn.1000-0976.2018.02.009

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

155. A simulation study on the preflush acid fracturing considering rock heterogeneity

Accession number: 20182905565431

Authors: Xue, Heng (1, 2, 3); Huang, Zuxi (1); Zhao, Liqiang (2); Jiang, Weidong (4); Liu, Pingli (2); Liang, Chong (2, 4)

Author affiliation: (1) China Zhenhua Oil Co., Ltd., Beijing; 100031, China; (2) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (3) Chengdu North Petroleum Exploration and Development Technology Company Limited, Chengdu; Sichuan; 610000, China; (4) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China

Corresponding author: Huang, Zuxi(huangzuxi@zhenhuaoil.com)

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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: When the preflush acid fracturing technology is carried out, a high-viscosity nonreactive pad fracturing fluid is used to fracture the reservoirs and generate hydraulic fractures. Then, an acidizing fluid is injected at high pressures to etch the surface of the fractures, so that a nonuniform surface of dissolved fractures is formed to increase the flow conductivity of fractures. For providing the theoretical basis for the preflush acid fracturing of deep carbonate reservoirs, a mathematical model for fracture acidizing in the cases with multiple minerals was established. Then, based on the pseudo-three dimensional fracture propagation model, a comprehensive control equation set was prepared to accurately describe the physical and chemical courses of preflush acid fracturing. Based on the control equation, the influences of key factors (e.g. rock bedding, rock composition percentage and flow rate) on the stimulation effects of preflush acid fracturing were simulated and analyzed. And the following research results were obtained. First, the rock bedding plays a leading role for the morphologies of etched fractures and horizontal beddings is conducive to increase the effective distance of acidizing fluid. Second, the higher the content of limestone

in carbonate minerals, the shorter the effective distance of acidizing fluid. Third, if the rock heterogeneity is considered in the preflush acid fracturing, a high flow rate can increase the effective distance of acidizing fluid, but the etched fractures become narrow correspondingly. It is concluded that different from conventional acid fracturing simulation methods, this method fully considers the rock distribution characteristics that are affected by geologic sedimentation and it can simulate authentically the nonuniform etch morphologies of fractures caused by rock heterogeneity. The research results provide a new method for the design optimization of the preflush acid fracturing in carbonate reservoirs and enrich the carbonate reservoir stimulation theories. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Minerals

Controlled terms: Acidization - Carbonation - Computer simulation - Fracturing fluids - Hydraulic fracturing - Lime - Petroleum reservoirs - Reservoirs (water) - Rocks

Uncontrolled terms: Acid fracturing - Carbonate rock - Etched fracture - Fracture propagation - Heterogeneity - Mineral composition - Stimulation

Classification code: 441.2 Reservoirs - 482.2 Minerals - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits :

Development Operations - 723.5 Computer Applications - 802.2 Chemical Reactions - 804.2 Inorganic Compounds

DOI: 10.3787/j.issn.1000-0976.2018.02.008

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

156. Application of CBM horizontal well development technology in the roof strata close to broken-soft coal seams

Accession number: 20185206284679

Title of translation:

Authors: Xu, Yaobo (1, 2, 3); Zhu, Yushuang (1, 2); Zhang, Peihe (3)

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) Xi'an Research Institute, China Coal Technology and Engineering Group, Xi'an; Shaanxi; 710054, China

Corresponding author: Zhu, Yushuang(yshzhu@nwu.edu.cn)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 70-75

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Broken coal structure and low permeability are the main reasons for the difficult production of coalbed methane (CBM) in broken- soft coal seams. In this paper, No.8 coal seam in the Luling Mine of the Huaibei Coal Field was taken as an example to study the way to improve CBM production of broken-soft coal reservoirs. First, drilling, fracturing and production of horizontal wells were considered comprehensively. Then, based on the idea of exploiting CBM through horizontal wells in roof strata close to the broken-soft coal seams, the propagation laws of fractures created by layer-penetrating fracturing of horizontal wells in roof strata were studied, and accordingly the location of horizontal well was optimized. Finally, the CBM horizontal well exploitation technology for the roof strata close to coal seams was developed and tested on site. And the following research results were obtained. First, the vertical fractures created during layer- penetrating fracturing of horizontal wells in roof strata can propagate from the roof strata with high stress values downward to the coal seam with low stress values. In addition, the location of horizontal well has an important influence on the effect of layer-penetrating fracturing. The closer the horizontal well is to the coal seam, the better the fracture propagation effect of layer-penetrating fracturing. Second, the horizontal well should be arranged in the roof strata 1.5 m away from the top of coal seam, so that fracturing stimulation requirements of horizontal wells in roof strata can be satisfied to the uttermost. Third, three key technologies are formed, including the "high-quality, fast and safe" drilling technology, the deep-penetration oriented perforating technology and the "large displacement, large scale, high pad ratio and moderate proppant concentration" active water fracturing technology. Fourth, the gas

production with this technology in engineering practice is remarkable. In conclusion, the CBM development technology of horizontal wells in roof strata close to broken-soft coal seams is feasible. The research results prove a new technical method for the development of CBM in broken-soft coal seams. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Horizontal wells

Controlled terms: Coal - Coal bed methane - Coal deposits - Coal mines - Firedamp - Fracture - Fracturing (fossil fuel deposits) - Infill drilling - Location - Methane - Natural gas wells - Oil well drilling - Roofs - Well stimulation

Uncontrolled terms: Close to broken-soft coal seam - Development technology - Layer-penetrating - Physical simulation - Roof strata - Well location

Classification code: 503 Mines and Mining, Coal - 503.1 Coal Mines - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 524 Solid Fuels - 804.1 Organic Compounds - 951 Materials Science

Numerical data indexing: Size 1.50e+00m

DOI: 10.3787/j.issn.1000-0976.2018.09.009

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

157. Risk assessment methods for fault reactivation induced by fluid injection

Accession number: 20185006230370

Title of translation:

Authors: Zhang, Jianyong (1, 2, 3); Cui, Zhendong (1, 2, 3); Zhou, Jian (4); Han, Weige (1, 2, 3); Yu, Hui (5); Wang, Yizhao (6)

Author affiliation: (1) Key Laboratory of Shale Gas and Geoenvironment, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing; 100029, China; (2) Institutions of Earth Science, Chinese Academy of Sciences, Beijing; 100029, China; (3) College of Earth and Planetary Sciences, University of Chinese Academy of Sciences, Beijing; 100049, China; (4) School of Mechanical Engineering, Beijing Institute of Petrochemical Technology, Beijing; 102617, China; (5) College of Geoscience and Surveying Engineering, China University of Mining and Technology, Beijing; 100083, China; (6) School of Civil and Resource Engineering, University of Science and Technology Beijing, Beijing; 100083, China

Corresponding author: Cui, Zhendong(cuizhendong@mail.iggcas.ac.cn)

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Pages: 33-40

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The human beings need to take more resources and space from the earth's deep interior increasingly, so geologic engineering activities in the deep interior become active gradually, such as the development of enhanced geothermal energy, the geological storage of carbon dioxide and the exploitation of shale gas. However, injection of high-pressure fluid into deep formations may reactivate existing faults and induce low-level earthquakes. In order to study the mechanisms, influential factors, risk assessment methods and countermeasures on this kind of earthquakes, we analyzed the main influential factors and key evaluation indicators of fault reactivation based on abundant literature researches, combined with domestic and foreign typical engineering cases of fluid injection-induced fault reactivation. Then, the mechanism of fluid injection inducing fault reactivation was discussed and its evaluation method and discrimination criterion were summarized. Finally, the problems existing in current researches and the research directions that need to break through urgently were pointed out. And the following research results were obtained. First, the main controlling factor of fault reactivation is in-situ stress. Whether the fault is reactivated is controlled by the state of the in-situ stress. When the in-situ stress acts as a restraint on fault slip, the risk of fault reactivation is relatively low. Second, the physical and mechanical properties of faults (such as permeability, internal friction angle and cohesive strength) are the internal causes for fault reactivation, and fluid injection rate and fluid injection volume

are the triggering factors. Third, the main fault reactivation risk assessment methods are currently the extension of the Mohr-Coulomb effective stress principle, which are not absolutely accurate. Therefore, they shall be applied flexibly based on the actual engineering geology and shall be improved and innovated continuously. Fourth, there is not sufficient practical experience in this new geological engineering field of injecting high-pressure fluid into the deep interior, and the research level is low, so there are a great number of urgent problems to be solved. In conclusion, it is crucial to enhance monitoring and scientific site selection, strengthen the studies on historical data of fluid injection, and formulate and complete subsurface fluid injection specifications as soon as possible. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 46

Main heading: Risk assessment

Controlled terms: Carbon dioxide - Digital storage - Earth (planet) - Earthquakes - Fault slips - Geothermal energy - High pressure engineering - Mechanical permeability - Mechanisms - Site selection - Specifications - Stresses

Uncontrolled terms: Countermeasure - Fault reactivation - Fluid injections - Influential factors - Internal friction angle - Main controlling factors - Physical and mechanical properties - Risk assessment methods

Classification code: 481.3.1 Geothermal Phenomena - 484 Seismology - 484.1 Earthquake Measurements and Analysis - 601.3 Mechanisms - 722.1 Data Storage, Equipment and Techniques - 804.2 Inorganic Compounds - 902.2 Codes and Standards - 914.1 Accidents and Accident Prevention

DOI: 10.3787/j.issn.1000-0976.2018.08.005

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

158. Application of the loop method to the preparation of gas reference material

Accession number: 20185206284685

Title of translation:

Authors: Fang, Zheng (1); Zhou, Xin (1); Li, Zhi'ang (1); Deng, Fanfeng (1); Dong, Liaoyu (1); Zheng, Liwen (1)

Author affiliation: (1) National Institute of Measurement and Testing Technology, Chengdu; Sichuan; 610021, China

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Publication year: 2018

Pages: 114-120

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: High-accuracy gas reference material is an important prerequisite to guaranteeing the accuracy of stoichiometry. At present, however, the existing procedures of preparing gas reference material are complicated and time-consuming with high degree of uncertainty, so it is difficult to realize the high-accuracy measurement of gas compositions. In this paper, a loop method of preparing the gas reference material was developed. Then, its uncertainty degree on trace materials and preparation process was assessed and compared with the preparation process of the traditional dilution method. Finally, its weighing value was verified by means of a gas chromatography. And the following research results were obtained. First, the weighing cylinder of traditional preparation methods need a balance of wide range and low precision, so the uncertainty degree in the weighing process is introduced many times by multi-stage dilution. Second, when the loop method is adopted to prepare mixed gas reference material, the preparation can be completed in one step, so the uncertainty degree introduced in the preparation process is decreased by one order of magnitude. Third, by virtue of the loop method, the previously-used preparation procedures are simplified, the consumption of raw material is reduced and the preparation efficiency of mixed gas reference material is increased. Fourth, the loop method has been successfully applied to the preparation of gas reference material of natural gas and sulfide mixtures, and it is promising in more extensive application to realize efficient preparation and accurate valuing of gas reference material. And fifth, a gas chromatography is used to verify the nominal value of mixed gas reference material prepared by the loop method. And it is indicated that the loop method is of strong feasibility and accuracy. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Gas chromatography

Controlled terms: Gases - Stoichiometry - Sulfur compounds - Uncertainty analysis - Weighing
Uncontrolled terms: High-accuracy - Loop - Multi stage - Reference material - Uncertainty assessment
Classification code: 801.4 Physical Chemistry - 802.3 Chemical Operations - 922.1 Probability Theory - 943.3 Special Purpose Instruments
DOI: 10.3787/j.issn.1000-0976.2018.09.015
Compendex references: YES
Database: Compendex
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Data Provider: Engineering Village

159. Construction of data resource sharing center of the Puguang Intelligent Gas-field Project

Accession number: 20185106260095

Title of translation:

Authors: Jiang, Yiwei (1); Li, Jinxian (2); Zhang, Hanwei (1); Wang, Qingyin (1); Yu, Yanqiu (1); He, Chunguang (2); Liang, Meisheng (1)

Author affiliation: (1) Puguang Branch of Sinopec Zhongyuan Oilfield Company, Dazhou; Sichuan; 635000, China; (2) Sinopec Zhongyuan Oilfield Company, Puyang; Henan; 457000, China

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Pages: 58-62

Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: During the initial construction of the Puguang Gas Field, information infrastructure was built. Due to the absence of unified planning and deployment, however, many "isolated information islands" are formed in data systems, and the data resources cannot meet the construction requirements of intelligent gas field. In this paper, the status quo and problems of data resources in the Puguang Gas Field were analyzed, and a data resource sharing center was constructed according to the overall architecture design of the Puguang Intelligent Gas-field Project. Based on the architecture design of data resource sharing center, the overall construction conception of data resource sharing center was put forward and the business data model was designed. Finally, the integrated data collection, storage, calculation and utilization was realized by establishing data standard, combing data source and designing data service, and then it was applied on site. And the following research results were obtained. First, the data resource sharing center is an important foundation for the construction of this Project, and its overall architecture is divided into three layers from bottom to top, i. e., data specification and standard, data collection, storage, calculation and utilization, and data control. Second, the data resource sharing center achieves the one-time collection, centralized storage, shared use and unified management of exploration & development, gathering & purification, production & operation and safety & environmental protection data, and provides an important data base for the construction of business system of intelligent gas field and a comprehensive, reliable and effective data support for the intelligent and mobile application in the Puguang Gas Field. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 10

Main heading: Information management

Controlled terms: Air purification - Data acquisition - Data handling - Digital storage - Gas industry - Gases - Petroleum prospecting - Specifications

Uncontrolled terms: Data Sharing - Distributed storage - Gas fields - Post data - Puguang gas field - Real-time data - Video data

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 643 Space Heating, Ventilation and Air Conditioning - 722.1 Data Storage, Equipment and Techniques - 723.2 Data Processing and Image Processing - 902.2 Codes and Standards

DOI: 10.3787/j.issn.1000-0976.2018.10.008

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

160. Heterogeneity characteristics and controlling factors of normal-pressure shale gas reservoirs in the basin-margin transition zone of SE Chongqing

Accession number: 20191306691379

Title of translation:

Authors: Pan, Renfang (1, 2); Li, Xiaotian (1, 2); Jin, Jineng (1, 2); Zhu, Zhengping (1, 2); Meng, Jianghui (1, 2)

Author affiliation: (1) Hubei Cooperative Innovation Center of Unconventional Oil and Gas, Yangtze University, Wuhan; Hubei; 430100, China; (2) MOE Key Laboratory of Exploration Technologies for Oil & Gas Resources, Wuhan; Hubei; 430100, China

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In the southeastern (SE) Sichuan Basin and its basin-margin transition zone (hereinafter referred to as the basin-margin transition zone of SE Chongqing), shale gas resource is abundant, but its beneficial development is difficult to achieve due to its geological complexity with the characteristics of normal formation pressures. In view of this, the heterogeneity of shale gas reservoirs of Upper Ordovician Wufeng-Lower Silurian Longmaxi Fms in this area and its main controlling factors were studied from the aspects of rock skeleton and reservoir space by means of X-ray diffraction, argon ion polishing-scanning electron microscopy and cryogenic nitrogen adsorption. And the following research results were obtained. First, the heterogeneity of Wufeng-Lower Silurian Longmaxi shale gas reservoirs in this transition zone is mainly manifested as skeleton heterogeneity and pore heterogeneity. Quality shale intervals are different from overlying shale intervals in terms of brittle mineral content, clay mineral content, organic abundance and porosity, and their vertical heterogeneity are stronger. Second, many types of reservoir spaces are developed, including organic pores, brittle mineral pores and fractures. And pores are obviously different in terms of morphology, distribution, sizes and structures, presenting a stronger microscopic heterogeneity. Third, the petrophysical parameters of shale (Poisson's ratio and Young's modulus) are different. Fourth, the main factor controlling the heterogeneity of shale gas reservoirs is the change of rock skeleton caused by the difference of sedimentary environment. Structural fractures and their pleiotropy enhance the heterogeneity of reservoirs. And diagenesis further changes the content of skeleton minerals and organic matters and influences the type and structure of pores, so as to intensify the heterogeneity of shale reservoirs. In conclusion, it is recommended that the lower submember of the first Member of Longmaxi Fm should be the preferred target layer for shale gas development, tectonic active zones and discordogenic faults should be avoided, and Nanchuan Block should be the preferably selected block. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 29

Main heading: Shale gas

Controlled terms: Elastic moduli - Energy resources - Gas adsorption - Gases - Musculoskeletal system - Organic minerals - Petroleum prospecting - Petroleum reservoirs - Reservoirs (water) - Scanning electron microscopy - Sedimentary rocks - Sedimentology

Uncontrolled terms: Heterogeneity, Skeleton - Pore - Sichuan Basin - Silurian - Transition zones

Classification code: 441.2 Reservoirs - 461.3 Biomechanics, Bionics and Biomimetics - 481.1 Geology - 482.2 Minerals - 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

DOI: 10.3787/j.issn.1000-0976.2018.12.003

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

161. Reasons and countermeasures for the seasonal gas shortage in 2017

Accession number: 20184706088043

Title of translation: 2017

Authors: Zhang, Shuquan (1); Sun, Zhu (1); Liu, Yang (1)

Author affiliation: (1) School of Business Administration, China University of Petroleum, Beijing; 102249, China

Corresponding author: Sun, Zhu(zhusun1231@163.com)

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Document type: Journal article (JA)

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Abstract: Studying the formation process of seasonal gas shortage in the winter of 2017 is of great significance to understand the current marketization situations of natural gas industry in China and promote its steady development. In this paper, the evolution process and severity of gas shortage in the winter of 2017 were analyzed based on a large amount of data. Then, the reasons for the gas shortage were studied systematically in the framework of natural gas supply and demand based on the previous research results, and the corresponding countermeasures were put forward. It is shown that the seasonal gas shortage in 2017 began to take shape in September, occurred initially in October, broke out intensively in November, developed continuously in December and eventually evolved into gas shortage all over the country. And its severity is embodied as a huge gas supply gap, a wide range of affected areas, a significant LNG price rise and so on. It is indicated that the reason for the seasonal gas shortage is that the increase of natural gas demand caused by the economic recovery and that the coal-to-gas conversion exceeds the increase of domestic and foreign natural gas supply under the constraint of production, transportation and storage capacity. And the corresponding countermeasures were put forward as follows. First, the fundamental way to solve the seasonal gas shortage is to promote the market-oriented reform of natural gas industry orderly by coordinating the upstream and the downstream with the midstream as the breakthrough point. Second, the opening of old pipe networks should be promoted and the new pipe networks should be constructed orderly, such as tie-lines, core pipeline networks and regional pipeline networks. Third, the impacts of economic fluctuations and coal-to-gas conversion should be alleviated and supply capacity should be strengthened. Fourth, some other measures are also helpful to solving gas shortage like accommodating the peak gas demand by means of seasonal price difference and peak-valley price difference, abolishing cross subsidy to promote gas price merging, making the regional emergency peak shaving plan and constructing regional markets, etc. In conclusion, the natural gas supply and demand is expected to be improved in 2018, but the situation is still not optimistic. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Natural gas transportation

Controlled terms: Coal storage - Coal transportation - Commerce - Digital storage - Economic and social effects - Gas industry - Gas supply - Gases - Metal recovery - Natural gasoline plants - Pipelines - Radar countermeasures

Uncontrolled terms: Conduction paths - Cross subsidy - Evolution process - Market oriented reforms - Pipe networks - Seasonal gas shortage - Shunt

Classification code: 503 Mines and Mining, Coal - 513.2 Petroleum Refineries - 522 Gas Fuels - 524 Solid Fuels - 619.1 Pipe, Piping and Pipelines - 716.2 Radar Systems and Equipment - 722.1 Data Storage, Equipment and Techniques - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.07.017

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

162. A CBM development well type optimization method based on the long-run marginal cost

Accession number: 20184706088042

Title of translation:

Authors: Dai, Youjin (1); Li, Shiqun (2); Xia, Liangyu (3); Li, Jingxin (1); Lü, Yang (4)

Author affiliation: (1) PetroChina Coalbed Methane Co., Ltd., Beijing; 100028, China; (2) China Petroleum International Exploration and Development Co., Ltd., Beijing; 100037, China; (3) School of Business Administration, China University of Petroleum, Beijing; 102249, China; (4) PetroChina Planning and Engineering Institute, Beijing; 100083, China

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Abstract: Reasonable optimization of development well type is the prerequisite to realize the economic and effective development of coalbed methane (CBM). However, the existing CBM development well type optimization methods are disadvantageous in many aspects. CBM is a kind of typical unconventional natural gas resource, and its study focuses on single-well evaluation. In this paper, the assessment method and the evaluation index (EI) for CBM development well type optimization based on the long-run marginal cost (LRMC) were constructed on the basis of CBM characteristics from the perspective of economic feasibility. Then, the corresponding decision making criteria were established. Finally, this newly developed method was applied to the well-type optimization of different development blocks in two important CBM development basins in China. And the following research and application results were obtained. First, under the current technical and economic conditions, both directional well and horizontal well are economically feasible to the development of Block A in the Qinshui Basin and Block B in eastern margin of the Ordos Basin, and the economically optimal well type is a horizontal well in Block A and a directional well in Block B. Second, compared with single-well steady daily gas production and single-well investment, the evaluation results on the schemes of different well types present critical value, above which the economic benefit of different schemes are equivalent. Third, EI of different well types is affected by many factors, e.g. geological characteristic of gas reservoirs, single-well production profile, CBM selling price, investment and cost. Therefore, it is necessary to carry out dynamic analysis and update in time based on the change of various influential factors so as to ensure the rationality of decision-making. In conclusion, this newly developed method is intrinsically consistent with traditional evaluation methods, and it is more advantageous with strong operability, intuitive evaluation results and quick and accurate optimization of CBM development well types. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Natural gas wells

Controlled terms: Behavioral research - Coal bed methane - Coal deposits - Costs - Decision making - Economic and social effects - Energy resources - Firedamp - Horizontal wells - Methane - Natural gas - Petroleum reservoir evaluation - Petroleum reservoirs

Uncontrolled terms: Critical point - Decision making criteria - Development wells - Directional well - Marginal costs - Surface development

Classification code: 503 Mines and Mining, Coal - 512 Petroleum and Related Deposits - 522 Gas Fuels - 525.1 Energy Resources and Renewable Energy Issues - 804.1 Organic Compounds - 911 Cost and Value Engineering; Industrial Economics - 912.2 Management - 971 Social Sciences

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Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

163. Analysis on the long-term prestress loss of the external walls of large LNG tanks

Accession number: 20191006600876

Title of translation: LNG

Authors: Cheng, Xudong (1); Wang, Zidong (1); Ma, Chuan (1); Wang, Hongjie (1); Zhang, Rulin (1)

Author affiliation: (1) Collage of Pipeline and Civil Engineering, China University of Petroleum, Qingdao; Shandong; 266580, China

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Volume: 38

Issue: 11**Issue date:** November 25, 2018**Publication year:** 2018**Pages:** 97-105**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Due to the coupling effect of concrete shrinkage creep and tendon stress relaxation, the prestressed system of the external walls of LNG tanks suffers from long-term prestress losses, which seriously affect the safety performance of the tanks. In this paper, a large LNG storage tank in China was taken as the research object. By using the age-adjusted effective modulus method and the relevant models in the design code of concrete structure, the multiple models were established by using the ABAQUS finite element software to simulate the prestress loss caused by shrinkage creep, stress relaxation and coupling effect. Then, the influence law of the interaction between shrinkage creep and stress relaxation on the long-term prestress loss was analyzed. Finally, the influence of two-way prestress on the long-term prestress loss was discussed. And the following research results were obtained. First, the ultimate (50 years) maximum of long-term losses in circumferential and vertical prestressing tendons reach 10.97% and 17.02% of the tension control stress, respectively. Second, the losses in circumferential and vertical prestressing tendons under the coupling effect of shrinkage creep and stress relaxation are 83.59% and 86.33% of the algebraic sum of shrinkage creep loss and stress relaxation loss. Third, the interaction reduction coefficient is proposed, and it reaches the minimum value when the shrinkage creep loss and the stress relaxation loss are close. Fourth, the effect of vertical prestress on the long-term prestress loss in circumferential prestressing tendons is obvious. In conclusion, the research results are crucial to the design safety of concrete wall of large LNG tanks. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20**Main heading:** Shrinkage**Controlled terms:** ABAQUS - Computer simulation - Concretes - Creep - Fuel tanks - Prestressing - Stress relaxation**Uncontrolled terms:** Abaqus finite element software - Age-adjusted effective modulus methods - Concrete shrinkage - LNG storage tank - Prestress loss - Prestressing tendon - Reduction coefficient - Two ways**Classification code:** 412 Concrete - 619.2 Tanks - 723.5 Computer Applications - 931 Classical Physics; Quantum Theory; Relativity - 951 Materials Science**Numerical data indexing:** Age 5.00e+01yr, Percentage 1.10e+01%, Percentage 1.70e+01%, Percentage 8.36e+01%, Percentage 8.63e+01%**DOI:** 10.3787/j.issn.1000-0976.2018.11.013**Compendex references:** YES**Database:** Compendex

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Data Provider: Engineering Village

164. Characteristics of buried structures in the northern Longmenshan mountains and its significance to oil and gas exploration in the Sichuan Basin

Accession number: 20185006230367**Title of translation:****Authors:** Yang, Yueming (1); Chen, Cong (2); Wen, Long (2); Chen, Xiao (2); Liang, Han (2); Liu, Ran (2); Guan, Xu (2); Luo, Bing (2); Xie, Chen (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; 610212, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 8**Issue date:** August 25, 2018**Publication year:** 2018**Pages:** 8-15**Language:** Chinese**ISSN:** 10000976

CODEN: TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: Since 2014, great gas discoveries have been achieved in the Upper Paleozoic Shuangyushi zone in the frontal belts of the Longmenshan mountains, northwestern (NW) Sichuan Basin, where multiple gas wells with industrial flows have been drilled and completed successively in the Middle Permian Qixia Fm and Middle Devonian Guanwushan Fm, etc. Along with the steady progress of exploration there, to make a further in-depth study on the characteristics of the frontal-piedmont zones in the Longmenshan thrust-nappe structures will be of great significance to both a better understanding of Upper Paleozoic gas reservoirs in this study area and the expansion of oil and gas exploration field. In view of this, based upon the 3D seismic surveys, gravity-magnetic-electronic data, and practical drilling information from exploration wells like Well Shuangtan 9, the characteristics of the frontal-piedmont zones in the Longmenshan thrust-nappe structures are analyzed as well as the features of the buried structures, gas pooling conditions and exploration prospect there. The following findings were obtained. (1) A huge buried structure is well developed underlying the Longmenshan front fault belt No.1 (LSFFB 1) and marine-facies strata are thus formed below the Lower Triassic Jialingjiang Fm due to the roles of compressive folding, extrusion and deformation. (2) The detachment horizons from LSFFB 1 go from shallow to deep in S-W trending, turning from Cambrian slip in the south to basement-involved in the north. The Paleozoic and its overlying strata were overall uplifted with a higher degree northward and so did the strata between the up-thrown and down-thrown sides of the faults with a greater displacement distance and higher folding degree, resulting in that the Paleozoic strata in the north are 1 500 higher uplifted than those in the south. (3) In the western Jiange and Guangyuan areas, the eastern LSFFB 1 presents a pattern of "three steps" as a whole. In conclusion, there are good gas pooling conditions in LSFFB 1, the downthrown sides of which cover an area of 1 800 km², where the Guanwushan and Qixia strata provide good accumulation and preserving spaces for gas reservoirs, which will become favorable gas exploration targets in the deep marine-facies strata in NW Sichuan Basin. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16**Main heading:** Petroleum prospecting**Controlled terms:** Discovery wells - Gases - Geological surveys - Infill drilling - Landforms - Metamorphic rocks - Multiple zones - Natural gas well production - Oil well drilling**Uncontrolled terms:** Buried structure - Down-thrown side - Nappe structure - Northwest (NW) - Sichuan Basin**Classification code:** 481.1 Geology - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits**Numerical data indexing:** Area 1.80e+09m²**DOI:** 10.3787/j.issn.1000-0976.2018.08.002**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

165. Calculation and analysis of dynamic drag and torque of horizontal well strings

Accession number: 20185006230376**Title of translation:****Authors:** Zhu, Xiaohua (1); Li, Ke (1); An, Jiawei (1)**Author affiliation:** (1) School of Mechanical Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 8**Issue date:** August 25, 2018**Publication year:** 2018**Pages:** 75-82**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: In recent years, shale gas production horizontal well types mainly include conventional horizontal well, highly deviated well and scoop-shape horizontal well. For the sake of construction decision making, it is necessary to study these three types of wells from the aspects of drag and torque characteristic, weight on bit transferring efficiency, key hole sections or links and extreme penetration length. In this paper, these three types of horizontal wells were taken as the study objects. Their drag and torque, load transfer and extended reach drilling were explored based on the

dynamic model of full hole drilling string and the simulation calculation of dynamic characteristics of full hole drilling string system. And the results were applied and tested on site in three shale gas wells (a conventional horizontal well, a highly deviated well and a scoop-shape horizontal well) in the Changning area, Sichuan Basin. And the following research results were obtained. First, the contact friction strength of the second half of the build-up section in the scoop-shape horizontal well is very high, and it is 1.67 times that of the hold section. The total contact force of build-up section in the scoop-shape horizontal well is 1.62 times that in the highly deviated well. Second, the contact friction strength of the hold section in highly deviated well is not only higher than that of its build-up section, but also higher than any characteristic section in the three well types of the same depth. Third, the operating stress of drilling strings during the drilling of three well types is not high, but during the extended reach drilling in the curved section of the scoopshaped horizontal well, it is necessary to focus on the twist off of drilling string in the hold section. Fourth, the weight on bit transferring efficiency of scoop-shaped horizontal well is lower than that of conventional horizontal well and highly deviated well. In conclusion, the research results preliminarily reveal the drag and torque characteristics and active load transferring mechanisms of conventional horizontal well, highly deviated well and scoop-shape horizontal well for shale gas production, and present important hole sections for safety assessment. They can be used as references for efficient and safe construction of shale gas horizontal wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 27

Main heading: Horizontal wells

Controlled terms: Decision making - Deflected boreholes - Directional drilling - Drag - Efficiency - Friction - Gases - Infill drilling - Shale gas - Torque

Uncontrolled terms: Characteristic sections - Contact - frictions - Dynamic characteristics - Extended reach drilling - Highly deviated hole - Highly deviated wells - Simulation calculation - Weight on bits

Classification code: 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 522 Gas Fuels - 912.2 Management - 913.1 Production Engineering - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.08.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

166. A computation model for gas supply reliability analysis in a gas pipeline network based upon the uncertainty of gas consumption

Accession number: 20185006230383

Title of translation:

Authors: Huang, Yanfei (1); Wu, Changchun (1); Chen, Qian (1); Wang, Li (1); Zuo, Lili (1); Zhao, Yanan (1); Qiu, Jing (2)

Author affiliation: (1) China University of Petroleum, Beijing; 102249, China; (2) Beijing Gas Group Co., Ltd., Beijing; 100035, China

Corresponding author: Wu, Changchun(wucc@cup.edu.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 126-133

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Because the future gas consumption is a random variable, the previously used point forecast method cannot fully embody its randomness, from which the resulted gas supply reliability assessment fails to objectively reflect the practical situation. In view of this, we first investigated the research progress in gas supply forecast modeling in gas pipeline network systems, and thus presented a gas-supply reliability calculation methodology for predicting the random gas consumption assisted with artificial neural network based on wavelet decomposition. Through an error analysis between the forecasted results from the presented method and the actual gas consumption, we determined the distribution types and parameters with which the gas consumption complies should comply. Then, in combination with the maximum allowable gas flow rate and with the maximum gas-supply reliability as objective function, we

established a mathematical model of optimizing flowrate distribution and calculating the gas-supply reliability, and finally applied this model to the analog computation and analysis of a simulated gas pipeline network. The following findings were obtained. (1) The flowrate distribution scheme resulted from the model gives priority to more important gas users or those with greater weight coefficients but this will sacrifice other users' gas-supply reliability, as a result, this will lower the overall reliability of the gas network system. (2) Without considering the weight factor, the overall reliability will be improved to guarantee such gas users closer to gas source locations; thus if it is unnecessary to fully satisfy all the gas users, the overall reliability will reach the standard which can be possibly lowered to some degree. It is concluded that this calculation methodology combined with the randomness of gas consumption can objectively assess the gas supply reliability of a gas pipeline network system and due to the introduction of the weight of users, more important users will be satisfied preferentially while the gas supply capacity is computed, as a result, this will conform to the actual situation and the assessment results will be taken as reference to the high-efficiency operation of gas pipeline network systems. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Gases

Controlled terms: Analog computers - Flow of gases - Forecasting - Functions - Gas pipelines - Gas supply - Linear programming - Mathematical models - Neural networks - Pipelines - Reliability analysis - Stochastic models - Uncertainty analysis - Wavelet decomposition

Uncontrolled terms: Distribution scheme - Gas consumption - Gas pipeline networks - High-efficiency operations - Objective functions - Stochastic optimizations - Supply reliability - Weight coefficients

Classification code: 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 631.1.2 Gas Dynamics - 722.5 Analog and Hybrid Computers - 921 Mathematics - 921.3 Mathematical Transformations - 922.1 Probability Theory

DOI: 10.3787/j.issn.1000-0976.2018.08.018

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

167. Key seismic survey technologies for deep complex geological structures: A case study of the northern section of the Longmenshan Fault Fold Belt in the Sichuan Basin

Accession number: 20182905565469

Authors: Zhao, Luzi (1); Zhang, Guangrong (1); Chen, Wei (1); Peng, Yong (1); Xie, Bing (1); Peng, Xin (2); Zhou, Qi (2); Zeng, Yiyang (1)

Author affiliation: (1) PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China; (2) CNPC Bureau of Geophysical Prospecting Inc., Zhuozhou; Hebei; 072750, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 39-48

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The northern Sichuan Basin, spreading in the northern section of the Longmenshan Fault Fold Belt, is characterized by dramatic fluctuations in surface landforms, development of abdominal faults, and low-quality seismic data, resulting in difficulties in clarifying relevant structures. The key target formation, the Mid-Permian Qixia Fm, is deeply buried with thin reservoirs and high heterogeneity, which brings great challenges to seismic prediction. Under such circumstances, researches have been conducted jointly in terms of seismic data acquisition, processing and interpretation, and finally some relevant seismic survey technologies were developed suitable for surface/underground complex structures. Through surface structural surveys, dynamic deep-well lithologic identification, single-point detector deployment and process optimization, acquisition parameters can be excited. In addition, by using an observation system with high coverage, wide azimuth and huge displacement, quality of acquired seismic data can be enhanced dramatically. Seismic imaging technologies for complex structures have been developed to enhance the quality of images for deep formations. These technologies are dominated by microscopic logging-constrained tomography static correction, high-resolution processing with fidelity and amplitude preservation and all-around PSDM in an angular domain. By using high-resolution gravity, magnetic and electric data, details related to

geological structures and faults can be identified. In combination with fine seismic data interpretation, structural details and fault features can be verified effectively. Based on forward modeling and fine seismic calibration of reservoirs in individual wells, suitable attributes can be identified for predictions related to the distribution of reservoirs. By using all these auxiliary technologies, a large-scale structural-lithologic composite trap with a total area of 1 223 km² has been discovered in the northwestern Sichuan Basin. The Shuangyushi-Jiangyou area as a whole distributes on structural highs. In the areas to the south of Shuangyushi, the Qixia Fm dolomite reservoirs of platform margins are continuously developed. In conclusion, these auxiliary technologies can effectively allow trap identification and thin reservoir prediction in complex structures in the study area. In addition to clarifying the exploration orientation and providing a necessarily technical supports for well deployment, these technologies help to accelerate the construction of demonstration projects for the exploration and development of deep marine carbonate formations. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Faulting

Controlled terms: Data acquisition - Data handling - Forecasting - Geological surveys - Image enhancement - Lithology - Oil field development - Optimization - Seismic prospecting - Seismic response - Seismic waves

Uncontrolled terms: 3D seismic data - Complex structure - Fold belts - Permian - Reservoir formation - Reservoir prediction - Seismic imaging - Sichuan Basin

Classification code: 481.1 Geology - 484 Seismology - 512.1.2 Petroleum Deposits : Development Operations - 723.2 Data Processing and Image Processing - 921.5 Optimization Techniques

Numerical data indexing: Area 1.22e+09m²

DOI: 10.3787/j.issn.1000-0976.2018.01.005

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

168. Calculation models for settlement resistance of oil and gas well drilling cuttings

Accession number: 20183905863719

Authors: Sun, Xiaofeng (1); Zhang, Kebo (1); Chen, Ye (1); Qu, Jingyu (1); Tang, Jie (1); Qu, Junbo (1)

Author affiliation: (1) School of Petroleum Engineering, Northeast Petroleum University, Daqing; Heilongjiang; 163318, China

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Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 94-102

Language: Chinese

ISSN: 10000976

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Document type: Journal article (JA)

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Abstract: In the process of oil and gas well drilling, the broken cuttings settle freely in the drilling fluid in the wellbore. To avoid downhole accidents caused by the cuttings settlement, therefore, it is necessary to study the cuttings settlement laws and predict the terminal cuttings settlement velocity. In this paper, a concept of resistance scale between viscosity and differential pressure was put forward based on the Stokes law and Newton-Rittinger model. Then, the equation of resistance scale was obtained by regressing the experiment data using the least square method. Finally, the resistance scale calculation model was derived for non-Stokes zone during the cuttings settlement in Newtonian fluids and power-law fluids. Furthermore, based on experimental data, the terminal cuttings settling velocity was calculated by using the new models. The following results were obtained. First, the viscosity and differential pressure on the cuttings during their settlement in power-law fluids are not only related to the particle Reynolds number, but to the flow behavior index and consistency index. Second, during the cuttings settlement in Newtonian fluids, the viscosity is higher than the differential pressure if the particle Reynolds number is less than 2.944 6. Third, the differential pressure is higher than the viscosity if the particle Reynolds number is higher than 2.944 6. Fourth, when the particle Reynolds number is lower than 1.11, the viscosity plays a dominant role in cuttings settlement; when the number is 1.11–500, cuttings settlement is under the joint effect of viscosity and differential pressure; when the number is higher than 500, the differential pressure is dominant. In conclusion, this calculation model can be used to predict the terminal settlement velocity of cuttings with a particle Reynolds number of 0-105 when the drilling fluid is a

Newtonian fluid, and the terminal settlement velocity of cuttings with a particle Reynolds number of 0-105 and a flow behavior index of 0.062 3-1 when the drilling fluid is a power-law fluid. These mentioned ranges can satisfy the drilling engineering requirements on the prediction of terminal cuttings settlement velocity. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 33

Main heading: Reynolds number

Controlled terms: Boreholes - Drilling fluids - Forecasting - Infill drilling - Least squares approximations - Natural gas wells - Newtonian liquids - Oil field equipment - Oil well drilling - Oil wells - Pressure - Velocity - Viscosity

Uncontrolled terms: Differential - Newtonian fluids - Oil and gas well drilling - Power law fluid - Resistancescale - Velocity prediction - Viscosity resistance - Wellbore

Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512 Petroleum and Related Deposits - 631.1 Fluid Flow, General - 921.6 Numerical Methods - 931.1 Mechanics - 931.2 Physical Properties of Gases, Liquids and Solids

DOI: 10.3787/j.issn.1000-0976.2018.05.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

169. Cyclone atomization based drainage gas recovery technology and its key parameters

Accession number: 20183905879912

Authors: Xue, Chengwen (1); Xie, Wenqiang (2); Gao, Han (1); Chi, Ming (1); Zhang, Guohong (1); Guo, Ling (1); Xue, Liang (3)

Author affiliation: (1) Engineering Technology Research Institute, PetroChina Xinjiang Oilfield Company, Karamay; Xinjiang; 834000, China; (2) Zhundong Production Plant, PetroChina Xinjiang Oilfield Company, Fukang; Xinjiang; 831500, China; (3) China University of Petroleum, Beijing, Beijing; 102249, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: During the production of a gas/water producing well, liquid tends to accumulate easily at the bottom hole due to the gradual decline of formation energy. And consequently, the productivity of the gas well is seriously impacted and the gas well may be even watered out and shut down. The operation cost of commonly used drainage gas recovery technologies is high, for they need the external energy or the replacement of original production string. In this paper, a cyclone atomizer was designed on the basis of the Turner model. By virtue of the cyclone atomizer, the liquid accumulated at the bottom hole is atomized into fine droplets, so that they can be carried out of the hole easily. Then, numerical simulation, laboratory visual tests and field tests were carried out to determine the key technological parameters of a cyclone atomization based drainage gas recovery process. And the following research results were obtained. First, with the application of this technology, bottom hole liquid loading is drained out of a gas well without any addition of external energy, making continuous liquid-carrying production possible. Second, this technology is advantageous with insensitivity to condensate content of a gas well, convenient operation, low production cost and reliable device. Third, the key technological parameters of the cyclone atomization based drainage gas recovery process are as follows. The maximum setting depth: 4 200 m; operation temperature: 120 ; gas/liquid ratio: more than 1 100 m³/m³; liquid producing rate: less than 20 m³/d; and tool OD: 58 mm or 72 mm. Fourth, this technology has been successfully applied in 2 gas wells. Well Dixi 17, a watered gas well recovered to production successfully with continuous liquid-carrying production. Well K82006 which was completed with large-diameter tubings presented a good liquid-carrying capacity and stable gas production rates. In conclusion, the cyclone atomization based drainage gas recovery technology is worth recommending, which keeps the original production string without any addition of external energy. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Well stimulation

Controlled terms: Atomization - Gases - Liquids - Natural gas well production - Natural gas wells - Recovery - Storms

Uncontrolled terms: Critical flow rate - Drainage gas recovery - External energy - Liquid loading - Matching tools - Production strings - Xinjiang

Classification code: 443.3 Precipitation - 512.2.1 Natural Gas Fields - 802.3 Chemical Operations

Numerical data indexing: Size 5.80e-02m, Size 7.20e-02m

DOI: 10.3787/j.issn.1000-0976.2018.06.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

170. Negative adsorption in the isotherm adsorption experiments of low-adsorption coal and shale

Accession number: 20183905879905

Authors: Tian, Wenguang (1, 2); Deng, Ze (1, 2); Wang, Hongyan (1, 2); Liu, Honglin (1, 2); Li, Guizhong (1, 2); Liu, Xuejun (3); Chen, Zhenhong (1, 2); Chen, Hao (1, 2); Li, Yanan (1, 2)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration and Development, Beijing; 100083, China; (2) CNPC KeyLaboratory of Unconventional Oil & Gas, Beijing; 102249, China; (3) PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China

Corresponding author: Deng, Ze(dengze@petrochina.com.cn)

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Negative adsorption of an inverse V type which rises first and then drops is often observed in the adsorption test of low adsorption samples. In view of this, a gravimetric isotherm rig with a large sample quantity was introduced. Its testing principles and operation processes were analyzed based on the previous research results. Then, the volumetric method, magnetic-levitation gravimetric method and large-sample-quantity gravimetric method were compared in terms of their advantages and disadvantages. Accordingly, this gravimetric isotherm rig with a large sample quantity was adopted to perform isotherm adsorption experiments on the low-rank coal samples taken from Well Jimei 2 in the Jiergalangtu sag, Erlian Basin, Inner Mongolia, and shale samples from the Lower Silurian Longmaxi Fm in the southern Sichuan Basin, so as to explore the essential reason for the "negative adsorption" after the effect of a systematical cumulative error is eliminated. And the following research results were obtained. First, when the large-sample-quantity gravimetric method is adopted, the phenomenon of "negative adsorption" doesn't occur and the test results of low-rank coal and shale samples are reliable with a high fitting degree ($R^2 > 0.99$). Second, an electronic sensor error (e.g. electronic balance and P&T sensors), a system accumulative error and an adsorbed phase density error are not the factors leading to the reversal of negative adsorption curves. Third, the void volume error of a sample cell is the essential reason for the negative adsorption. In conclusion, the test accuracy can be improved by introducing the volume correction factor into the isotherm adsorption interpretation algorithm. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Adsorption

Controlled terms: Adsorption isotherms - Coal - Electronic scales - Errors - Inverse problems - Magnetic levitation - Shale

Uncontrolled terms: Gravimetric methods - Isotherm adsorption - Negative adsorption - Phase density - Sample cell - Void volume - Volumetric methods

Classification code: 524 Solid Fuels - 701.2 Magnetism: Basic Concepts and Phenomena - 802.3 Chemical Operations

DOI: 10.3787/j.issn.1000-0976.2018.06.003

Compendex references: YES

Database: Compendex
Compilation and indexing terms, Copyright 2019 Elsevier Inc.
Data Provider: Engineering Village

171. Natural gas in China: Development trend and strategic forecast

Accession number: 20183905876122
Authors: Zou, Caineng (1); Zhao, Qun (1); Chen, Jianjun (1); Li, Jian (1); Yang, Zhi (1); Sun, Qinqing (1); Lu, Jialiang (1); Zhang, Gangxiong (1)
Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China
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Issue date: April 25, 2018
Publication year: 2018
Pages: 1-11
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Number of references: 40
Main heading: Underground gas storage
Controlled terms: Coal deposits - Coal preparation - Coal storage - Liquefied natural gas - Methane - Natural gas - Natural gas well production - Pipelines - Shale gas - Tight gas
Uncontrolled terms: China - Domestic production - Natural gas demand - Natural gas development - Natural-gas production - New energies - Pipeline gas - Unconventional natural gas
Classification code: 503 Mines and Mining, Coal - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 523 Liquid Fuels - 524 Solid Fuels - 619.1 Pipe, Piping and Pipelines - 804.1 Organic Compounds
DOI: 10.3787/j.issn.1000-0976.2018.04.001
Compendex references: YES
Database: Compendex
Compilation and indexing terms, Copyright 2019 Elsevier Inc.
Data Provider: Engineering Village

172. Economic adaptability of quartz sand for shale gas reservoir fracturing

Accession number: 20183905863716
Authors: Yang, Lifeng (1, 2); Tian, Zhuhong (1, 2); Zhu, Zhongyi (3); Yan, Xingming (1, 2); Yi, Xinbin (1, 2); Duan, Guifu (1, 2); Meng, Chuanyou (1, 2); Zou, Yushi (4)
Author affiliation: (1) CNPC Key Laboratory of Oil and Gas Reservoir Stimulation, Langfang; Hebei; 065007, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Beijing; 100083, China; (3) Shale Gas Research Institute, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (4) China University of Petroleum, Beijing, Beijing; 102249, China
Source title: Natural Gas Industry
Abbreviated source title: Natur. Gas Ind.
Volume: 38
Issue: 5
Issue date: May 25, 2018
Publication year: 2018
Pages: 71-76
Language: Chinese
ISSN: 10000976
CODEN: TIGOE3
Document type: Journal article (JA)
Publisher: Natural Gas Industry Journal Agency
Abstract: In the Changning-Weiyuan area of the Sichuan Basin, 40~70 mesh ceramsite that can keep high flow conductivity at high closure pressure is always used as the main proppant in the fracturing of shale gas reservoirs the minimum principal stress of which ranges between 44 and 68 MPa, but its consumption and cost are high. To reduce the cost of proppant, the flow conductivity required to support the fractures in the reservoirs was demonstrated by

means of numerical reservoir simulation. Then, the effective stress of reservoir on the proppant, the loading rate of effective stress and the proppant placement concentration were analyzed by using the analysis results of shale gas well production and the simulation results of hydraulic fractures. Finally, the experimental method suitable for the flow conductivity of proppant used in the shale gas well fracturing in the study area was developed and the flow conductivity of quartz sand and its effect on the productivity were evaluated. Furthermore, this method was used for the screening and field test of proppant. The following results were obtained. First, when the matrix permeability of shale is lower than 6.0×10^{-4} mD, the production requirement can be satisfied as long as the flow capacity of main fractures and branch fractures are $0.8 \sim 1 D \cdot \text{cm}$ and $0.05 \sim 0.10 D \cdot \text{cm}$, respectively. Second, when main fractures are vertical to the minimum principal stress and branch fractures are vertical to main fractures, the maximum effective stress of shale reservoirs on the proppant in the main fractures is 54 MPa and that in the branch fractures is about 69 MPa. Third, the experimental method for evaluating standard proppant flow conductivity is modified by setting the stress loading rate at 1.0 MPa/min, the proppant placement concentration at 2.5 kg/m² and the maximum loading pressure at 70 MPa. And fourth, the 70/140 mesh quartz sands are selected as the optimum proppant for shale gas well fracturing in the study area. The application in 4 wells on two pads in shows that single-section gas production rate is not changed obviously and single-well proppant cost is reduced by CNY 0.6-1 million when the ratio of quartz sand is increased from 30% to 70%. And the cost may be cut further if quartz sand is acquired from local markets. In conclusion, the study results provide a technical support for cost reduction by replacing ceramsite with quartz sand in the tight oil/gas reservoirs the matrix permeability of which is extremely low. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 11

Main heading: Fracture

Controlled terms: Cost reduction - Gases - Low permeability reservoirs - Mesh generation - Natural gas well production - Natural gas wells - Oil wells - Petroleum reservoir engineering - Proppants - Quartz - Reservoirs (water) - Sand - Shale gas - Stress analysis

Uncontrolled terms: Ceramsite - Changning-Weiyuan area - High stress - Loading rate - Quartz sand

Classification code: 441.2 Reservoirs - 482.2 Minerals - 483.1 Soils and Soil Mechanics - 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 723.5 Computer Applications - 951 Materials Science

Numerical data indexing: Percentage $3.00 \times 10^1\%$ to $7.08 \times 10^3\%$, Pressure 4.40×10^7 Pa to 6.80×10^7 Pa, Pressure 5.40×10^7 Pa, Pressure 6.90×10^7 Pa, Pressure 7.00×10^7 Pa, Surface_Density 2.50×10^0 kg/m²

DOI: 10.3787/j.issn.1000-0976.2018.05.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

173. Analysis of sustainable development of natural gas market in China

Accession number: 20183905876138

Authors: Yang, Jianhong (1)

Author affiliation: (1) PetroChina Planning and Engineering Institute, Beijing; 100083, China

Corresponding author: Yang, Jianhong(dushengege@sina.com)

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Publication year: 2018

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 9

Main heading: Gases

Controlled terms: Air pollution control - Coal deposits - Commerce - Costs - Natural gas - Natural gas deposits - Petrochemicals - Planning - Sustainable development

Uncontrolled terms: Bohai Sea - China - Consumption - Explosive growth - Industrial fuels - Natural gas markets

Classification code: 451.2 Air Pollution Control - 503 Mines and Mining, Coal - 512.2 Natural Gas Deposits - 513.3 Petroleum Products - 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics - 912.2 Management

DOI: 10.3787/j.issn.1000-0976.2018.04.017

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

174. Discharge effect analysis and improvement of the venting system of large diameter and high pressure gas line pipes

Accession number: 20182905565436

Authors: Li, Yutian (1, 2); Ji, Zhongli (1); Yu, Yang (3); Zhang, Wenhua (4)

Author affiliation: (1) China University of Petroleum, Beijing, Beijing; 102200, China; (2) PetroChina Planning & Engineering Institute, Beijing; 100083, China; (3) PetroChina Oil & Gas Pipeline Control Center, Beijing; 100007, China; (4) Beijing Gas Group Co. Ltd., Beijing; 100035, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Large diameter and high pressure gas pipes can increase the pipeline transportation capacity of natural gas, but they have higher requirements for the design, construction and operation of pipe venting systems. To explore the relationship between their venting effect and their diameter and pressure, the venting parameters (e.g. vent volume, discharge rate, Mach number and safe thermal radiation radius) of gas pipes of different diameters and pressure ratings were simulated and analyzed using multiple simulation softwares (such as TGNET, PHAST and FLARENET) based on the design and construction standards on venting systems of long distance gas line pipes. And the following research results were obtained. First, with the increase of the diameter and pressure rating of gas pipes, the volume of the section cut by the block valve chamber increases significantly under existing specification, so the amount of natural gas to be released increases exponentially. Second, with the upgrading of pipe size, the discharge rate of the venting system and the flow rate at the nozzle of vent pipes also increase exponentially, and the corresponding venting parameters (e.g. Mach number, noise and safe thermal radiation radius) also rise significantly. Besides, the safe gas diffusion radius is also impacted, and the threat to people and environment in the process of venting is intensified greatly. To cope with the threat caused by the vent of large diameter and high pressure gas pipes and alleviate the adverse impact of venting systems on people and environment, we made the following three suggestions: to shorten the distance of high grade pipes between adjacent valve chambers in various areas so as to reduce the total venting amount; to increase the number of vent pipes in valve chambers; and to extend the allowable venting period so as to decrease the discharge rate of vent risers. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 16

Main heading: Natural gas transportation

Controlled terms: Aerodynamics - Computer software - Gas pipelines - Gases - Heat radiation - High pressure effects - Mach number - Mufflers - Natural gas - Pumping plants - Vents

Uncontrolled terms: High pressure - Large diameter - PHAST - Suggestions for improvement - Valve chambers - Venting consequence - Venting system

Classification code: 446 Waterworks - 522 Gas Fuels - 612.1.1 Internal Combustion Engine Components - 641.2 Heat Transfer - 651.1 Aerodynamics, General - 723 Computer Software, Data Handling and Applications - 943.2 Mechanical Variables Measurements

DOI: 10.3787/j.issn.1000-0976.2018.02.013

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

175. Fine characterization of pores and fractures in coal based on a CT scan

Accession number: 20183805830743

Authors: Song, Dangyu (1, 2); He, Kaikai (1); Ji, Xiaofeng (1); Li, Yunbo (1, 2); Zhao, Haotian (1)

Author affiliation: (1) School of Resources & Environment, Henan Polytechnic University, Jiaozuo; Henan; 454000, China; (2) Collaborative Innovation Center of Coalbed Methane and Shale Gas for Central Plains Economic Region, Jiaozuo; Henan; 454000, China

Corresponding author: He, Kaikai(13939169380@163.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Pages: 41-49

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to reveal the occurrence and migration mechanism of coalbed methane (CBM), it is necessary to qualitatively analyze and quantitatively and precisely characterize the pores and fractures in coal beds. In this paper, the raw coal of 3# coal seam in the Wuyang coal mine, southern Qinshui Basin, was taken as a study object. Its core was scanned step by step in a 360° full angle by using X-ray and a 3D digitized visual model was constructed with the aid of CT analysis. Then, the gray threshold segmentation point of the pores and fractures were obtained by using the digital terrain model (DTM) of gray threshold segmentation, and the pores and fractures in coal beds were identified and compared with the scanning electron microscope (SEM) results. Finally, the ball-and-stick model for pore and fracture systems was established by using the software Avizo to characterize pores and fractures quantitatively, and the quantitative characterization was compared with the results of mercury injection tests. And the following research results were obtained. First, the DTM gray threshold segmentation method can accurately identify the pores and fractures in coal beds, and as for the same fracture, it is basically consistent with SEM image in terms of morphology and developmental scale. Second, by means of a CT scan, the pores and fractures with the diameter larger than 12.40 μm in the samples with a diameter of 19.20 mm and a height of 10.59 mm can be identified accurately and their 3D spatial distribution can be presented. Third, mercury injection test results and CT scan results are different only in the sections with non-connected pores of 20-40 μm in diameter as the dominant, while they present a consistent change trend of pore volume in the sections with pore diameters larger than 40 μm, and the analysis results of CT scan are more reliable. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 30

Main heading: Computerized tomography

Controlled terms: Coal - Coal deposits - Coal mines - Fracture - Image segmentation - Methane - Porosity - Scanning electron microscopy - Software testing - Three dimensional computer graphics

Uncontrolled terms: Digital terrain model - Distribution characteristics - Quantitative characterization - Southern qinshui basins - Stick model - The scanning electron microscopes (SEM) - Three-dimensional reconstruction - Threshold segmentation

Classification code: 503 Mines and Mining, Coal - 503.1 Coal Mines - 524 Solid Fuels - 723.5 Computer Applications - 804.1 Organic Compounds - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

Numerical data indexing: Size 1.06e-02m, Size 1.24e-05m, Size 1.92e-02m, Size 2.00e-05m to 4.00e-05m, Size 4.00e-05m

DOI: 10.3787/j.issn.1000-0976.2018.03.005

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

176. Countermeasures and suggestions on natural gas peak shaving and supply guarantee in China

Accession number: 20183905876139

Authors: Zheng, Dewen (1, 2); Zhang, Gangxiong (1); Wei, Huan (1); Ding, Guosheng (1, 2); Qi, Honglin (1, 2); Li, Dongxu (1, 2)

Author affiliation: (1) Underground Gas Storage Research Institute, PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) CNPC Key Laboratory of Underground Oil & Gas Storage Engineering, Langfang; Hebei; 065007, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 28

Main heading: Natural gas transportation

Controlled terms: Economics - Gas supply - Liquefied natural gas - Natural gas - Underground gas storage

Uncontrolled terms: China - Energy channels - Gas storage - Heating season - Liquefied Natural Gas (LNG) - Peak shaving - Supply sides

Classification code: 522 Gas Fuels - 523 Liquid Fuels - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.04.018

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

177. A new deliverability evaluation method of gas condensate wells in gas-liquid twophase state

Accession number: 20183905876134

Authors: Lu, Jialiang (1); Zhang, Hao (2, 3); Chang, Baohua (1); Cao, Wen (1); Sun, Hedong (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) University of Chinese Academy of Sciences, Beijing; 100049, China; (3) Institute of Porous Flow and Fluid Mechanics, Langfang; Hebei; 065007, China

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Pages: 111-116

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Gas well deliverability evaluation and analysis can be difficult to carry out due to the frequent abnormalities of deliverability test data of gas condensate wells caused by seepage of oil and gas phases in the reservoirs. To this end, based upon the pseudo-single-phase seepage equation and the oil-gas two-phase seepage equation, a new deliverability evaluation method was established respectively for the following two cases when the flow of a gas well reaches the quasi-steady stage, i. e., the pseudo-single-phase stable point deliverability evaluation for the case when the formation pressure is above the dew pressure; the gas-liquid two-phase stable point deliverability evaluation for the case when the formation pressure is below the dew pressure. Using this established deliverability evaluation method, based on the basic parameters of the Yaha gas field, Tarim Basin, the IPR curves were first obtained of gas wells at the same production gas-oil ratio and at the formation pressure above and below the dew point pressure; then, according to the four condensate gas fields, such as Yaha, Tazhong, Qianmiqiao and Dina 2, the absolute open flow (AOF) potentials of condensate gas wells under different gas-oil production ratios were calculated. Finally, through statistical analysis of the calculation results from typical wells, the following findings were obtained. This new deliverability evaluation method under the two states of condensate gas wells with quasi-single-phase and gas-liquid two-phase stable points can be used to avoid such cases due to the oil-gas flow in a condensate gas well unresolved by the classical deliverability evaluation methods. Also, with the increase of gas-oil ratios in gas condensate wells, a variable discrepancy is gradually reduced in AOF potentials calculated respectively by the quasi-single-phase and gas-

liquid two-phase stable point deliverability evaluation equations. For the condensate gas wells with high condensate content and low condensate gas production rates, the AOF potentials calculated by the gas-liquid two-phase stable point deliverability equation is more appropriate and reliable compared with that obtained by classical methods. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Gas condensates

Controlled terms: Flow of gases - Gas industry - Gases - Liquids - Natural gas well production - Natural gas wells - Offshore oil well production - Oil well testing - Petroleum reservoir evaluation - Petroleum reservoirs - Seepage - Two phase flow

Uncontrolled terms: Absolute open flow potential - Deliverability - Gas - liquid two-phase flows - Gas condensate reservoirs - Gas well - Single phase - Stable points - Two phase

Classification code: 511.1 Oil Field Production Operations - 512 Petroleum and Related Deposits - 522 Gas Fuels - 631.1 Fluid Flow, General - 631.1.2 Gas Dynamics

DOI: 10.3787/j.issn.1000-0976.2018.04.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

178. Accumulation patterns of low-rank coalbed methane gas in the Jiernalangtu Sag of the Erlian Basin

Accession number: 20183905876128

Authors: Sun, Qiping (1, 2); Wang, Shengwei (1); Tian, Wenguang (2); Sun, Bin (2); Chen, Yanjun (3); Yang, Qing (2); Chen, Hao (2); Yang, Minfang (2); Qi, Ling (2)

Author affiliation: (1) China University of Geosciences-Wuhan, Wuhan; Hubei; 430074, China; (2) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (3) PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China

Corresponding author: Tian, Wenguang(tianwg69@petrochina.com.cn)

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Erlian Basin is a typical low-rank lignite distribution area in China. Its coalbed methane (CBM) resources are abundant, but the CBM enrichment and accumulation mechanisms are not understood sufficiently, which restricts the exploration and development of low-rank CBM gas. In this paper, with low-rank CBM gas reservoirs in the Jiernalangtu Sag of the Erlian Basin as an example, the main factors controlling CBM accumulation were analyzed from the aspects of coal bed distribution, gas content, CBM origin, biogenic gas simulation experiment and preservation conditions, and then the future exploration direction was pointed out. Some results were obtained. First, a thick coal bed is developed at the central belt-gentle slope of the Jiernalangtu Sag in the coal forming environment of shallow lake basins, and it compensates for the deficiency of gas content. Second, mudstones overlying coal beds are developed periodically due to the periodic occurrence of shallow lake during the accumulation of coal bearing sections, so the caprocks are favorable. Third, the central belt-gentle slope of the Jiernalangtu Sag is located in a confined groundwater area, where the hydraulic lateral sealing is favorable for CBM accumulation. Fourth, CBM in the study area is biogenic with an in-situ gas production ratio of 0.25 mL/g, and currently the generation of biogenic gas still continues. Fifth, the CBM enrichment pattern in the fault basin is that biogas and CBM gas are both sealed by confined water. It is concluded that the key factors for CBM accumulation in the Jiernalangtu Sag are thick coal beds, biogas generation, favorable seals/caprocks and hydraulic confined areas. Besides, the Well L12-S88 area in the central belt-gentle slope of the Jiernalangtu Sag is the favorable area for future CBM productivity construction. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 34

Main heading: Coal deposits

Controlled terms: Biogas - Coal - Coal bed methane - Confined flow - Firedamp - Groundwater - Lakes - Methane - Petroleum prospecting - Petroleum reservoirs

Uncontrolled terms: Accumulation pattern - Confined water - Erlan Basin - Fault basin - Favorable area - Jiernalangtu Sag - Low rank coals

Classification code: 444.2 Groundwater - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 524 Solid Fuels - 631.1 Fluid Flow, General - 804.1 Organic Compounds

Numerical data indexing: Specific_Volume 2.50e-04m3/kg

DOI: 10.3787/j.issn.1000-0976.2018.04.007

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

179. Development of keshen ultra-deep and ultra-high pressure gas reservoirs in the kuqa foreland basin, tarim basin: understanding points and technical countermeasures

Accession number: 20183905879903

Authors: Jiang, Tongwen (1); Sun, Xiongwei (1)

Author affiliation: (1) PetroChina Tarim Oilfield Company, Korla, 841000, China

Corresponding author: Jiang, Tongwen(jangtw-tlm@petrochina.com.cn)

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Pages: 1-9

Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The Keshen Gas Field in the Kuqa foreland basin, Tarim Basin, is a rare fractured tight sandstone gas reservoir with ultra depth and ultra high pressure. During its pilot period of gas field development, the development effect is poor with a low development well success rate, a low utilization rate of production capacity and a rapid decline of gas well productivity. In view of these problems, development experiments and technological research were carried out continuously after the geological characteristics of gas reservoirs, productivity control factors, reservoir connectivity, seepage characteristics, gas and water relations and water invasion laws were studied thoroughly. And consequently, the development countermeasures of "well placement in high position, moderate stimulation and early-stage drainage" were prepared, and five matching development technologies were formed, such as description technology of ultra deep complex structures, well pattern optimization technology for fractured tight sandstone gas reservoirs, fracture net acid fracturing technology for fractured tight sandstone reservoirs, dynamic monitoring technology for ultra deep and ultra high pressure gas wells, wellbore integrity management and evaluation technology for high pressure gas wells. The following remarkable application results were achieved in the process of gas field development. First, the drilling depth error of the target formation drops from 125 m to less than 30 m. Second, the utilization rate of production capacity in the Keshen 8 Block reaches 100%. Third, the average absolute open flow rate is increased by 5 times to 273×104 m3/d from 50×104 m3/d before the stimulation. Fourth, safe and smooth production under high temperature and high pressure conditions is realized in the Keshen Gas Field. In conclusion, the successful efficient development of the Keshen Gas Field provides the experience for the development of similar gas reservoirs at home and abroad and its development countermeasures and matching technologies have important guidance and reference significance. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 27

Main heading: Reservoir management

Controlled terms: Fracture - Gas industry - Gases - Natural gas well production - Natural gas wells - Petroleum reservoir evaluation - Productivity - Sandstone - Tight gas - Well stimulation

Uncontrolled terms: Cretaceous - Development technology - Fractured - Gas fields - High temperature - Kuqa foreland basin - Tarim Basin - Tight sandstone gas - Ultra deeps - Ultrahigh pressure

Classification code: 482.2 Minerals - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 951 Materials Science

Numerical data indexing: Percentage 1.00e+02%, Size 3.00e+01m

DOI: 10.3787/j.issn.1000-0976.2018.06.001

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

180. Efficient development technologies for ultradeep, overpressured and fractured sandstone gas reservoirs: A cased study of the Kelasu Gas Field in the Tarim Basin

Accession number: 20183905876131

Authors: Wang, Zhenbiao (1); Sun, Xiongwei (1); Xiao, Xiangjiao (1)

Author affiliation: (1) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China

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Document type: Journal article (JA)

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Abstract: The Kelasu Gas Field in the Kuqa Depression of the Tarim Basin is a rare ultradeep, overpressured and fractured sandstone gas reservoir in China. Its development is faced with multiple difficulties in such aspects as the determination of ultradeep traps and faults, prediction of gas and water distribution in reservoirs, fine gas reservoir description, evaluation and prediction of fracture activity change, dynamic monitoring data acquisition, seepage mechanism study, and prediction and treatment of water influx. In this paper, a series of researches were carried out, including seismic processing and interpretation of ultradeep complex structures, quantitative description and geologic modeling of fractured tight reservoirs, fault activity evaluation, dynamic monitoring of overpressured gas wells, and seepage mechanism experiments under super high pressures. Then, combined with the optimal development technology and strategy which consider the effect of water influx, a series of development technologies suitable for this type of reservoirs were developed and applied to such gas fields. Some results were obtained. First, by virtue of the seismic acquisition technology of wide azimuth, large coverage and high density and the prestack depth migration processing technology based on the high-accuracy velocity model, the seismic data quality of piedmont ultradeep complex structures can be improved effectively, so that its trap and fault confirming degree can be increased. Second, the risk of structural offset can be better avoided by arranging the wells mainly in the high position along the axial line, and consequently reserves can be produced effectively and edge water influx can be relayed. Third, water prevention, control and drainage are key aspects that shall be considered in the whole life cycle of fractured tight sandstone gas reservoir development, and moderate production and water drainage in the case of water breakthrough are the main development technical measures. Fourth, this series of development technologies are well applied in the Kelasu Gas Field. As a result, the success ratio of drilling and productivity are both 100%, the percentage of efficient wells is 78% and the annual gas production rate is increased quickly to 74×10⁸ m³ from 3×10⁸ m³. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Petroleum reservoir evaluation

Controlled terms: Data acquisition - Dynamics - Forecasting - Fracture - Gas industry - Gases - Life cycle - Petroleum reservoirs - Sandstone - Seepage - Seismic prospecting - Seismology - Technology transfer - Tight gas - Water supply systems - Water treatment

Uncontrolled terms: Development technology - Efficient development - Fractured - Gas fields - Kuqa depression - Overpressured - Tarim Basin - Tight sandstone gas - Ultra deeps

Classification code: 445.1 Water Treatment Techniques - 446.1 Water Supply Systems - 482.2 Minerals - 484.1 Earthquake Measurements and Analysis - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 723.2 Data Processing and Image Processing - 951 Materials Science

Numerical data indexing: Percentage 1.00e+02%, Percentage 7.80e+01%

DOI: 10.3787/j.issn.1000-0976.2018.04.010

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

181. Fine evaluation on complex karst gas reservoirs of Lower Ordovician Majiagou Fm in the south zone of the Sulige Gas Field, Ordos Basin

Accession number: 20183905876126

Authors: Fu, Jinhua (1); Huang, Yougen (2, 3); Zheng, Xiaopeng (2, 3); Wang, Shujie (2, 3); Hu, Weiwei (2, 3)

Author affiliation: (1) PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (2) Exploration and Development Research Institute, PetroChina Changqing Oilfield Company, Xi'an; Shaanxi; 710018, China; (3) National Engineering Laboratory of Low-permeability Oil & Gas Exploration and Development, Xi'an; Shaanxi; 710018, China

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Pages: 46-52

Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Erosion grooves and dissolution pits exist in Ma55 of the Low Ordovician Majiagou Fm gas reservoir in the south zone of the Sulige Gas Field, Ordos Basin, thus revealing a strong heterogeneity. Traditional reservoir evaluation methods are not accurate in the prediction of Ma55, making well deployment quite difficult. In this paper, the paleo-geomorphology was described quantitatively by using the residual thickness method, impression method, geophysical method and layer flattening technique based on the sedimentary microfacies studies. Then, combined with the study on the diagenesis difference and the characteristics of karstification, the reservoir quality was evaluated, the plane distribution of reservoirs was described, and the development areas of effective reservoirs were confirmed. The following research results were obtained. First, the study area is located in the transition zone between karst high and karst slope. In this area, three-order geomorphic units are developed, including paleo-monadnock, paleo-slope and paleo-groove, among which paleo-monadnock is the most favorable geomorphic unit. Second, the thickness of Ma55 dolomite is vertically 10-20 m, but the thickness of fractured-vuggy reservoirs is only 2-8 m. Third, karstification weakens, filling degree increases and physical properties of reservoirs gradually deteriorate laterally from west to east. Fourth, the Ma55 reservoir is characterized by a strong heterogeneity and obvious plane zoning. The effective reservoirs are generally distributed in an isolated shape and can be divided into several independent geological units. The research results play an effective role in guiding the beneficial development of Lower Paleozoic carbonate gas reservoirs in this study area. As a result, the natural gas productivity reaches the expected target and 14 gas wells realize the daily gas production rate of more than one million cubic meters. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 18

Main heading: Petroleum reservoir evaluation

Controlled terms: Dissolution - Gas industry - Gases - Geomorphology - Landforms - Metamorphic rocks - Natural gas well production - Natural gas wells - Petroleum reservoirs - Quality control - Sedimentology

Uncontrolled terms: Beneficial development - Early ordovician - Main controlling factors - Ordos Basin - Reservoir quality - Sedimentary micro-facies - Sulige gas field

Classification code: 481.1 Geology - 481.1.1 Geomorphology - 512 Petroleum and Related Deposits - 522 Gas Fuels - 802.3 Chemical Operations - 913.3 Quality Assurance and Control

Numerical data indexing: Size 1.00e+01m to 2.00e+01m, Size 2.00e+00m to 8.00e+00m

DOI: 10.3787/j.issn.1000-0976.2018.04.006

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

182. Influence of reservoir heterogeneity on water invasion differentiation in carbonate gas reservoirs

Accession number: 20183905879911

Authors: Feng, Xi (1); Peng, Xian (1); Li, Longxin (1); Yang, Xuefeng (1); Wang, Juan (1); Li, Qian (1); Zhang, Chun (1); Deng, Hui (1)

Author affiliation: (1) Exploration and Development Research Institute, PetroChina Southwest Oil and Gasfield Company, Chengdu; Sichuan; 610041, China

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Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Diversified heterogeneities tend to occur in carbonate gas reservoirs due to different scales and distribution densities of pores, caves and fractures in reservoirs, and consequently the water invasion laws of gas reservoirs are more different. In this paper, the methods quantitatively describing the matching relationships between pores, caves and fractures were improved based on full-diameter core digital processing and analysis so as to understand the heterogeneity of carbonate reservoirs and its influence on the water invasion laws of gas reservoirs and then predict the water invasion dynamics of gas reservoirs. Firstly, a new method to evaluate the contribution of microfractures to reservoir seepage capacity was established according to the analysis chart of percolation theory. Then, gas-water relative permeability and rock compression coefficient were measured by conducting gas/water seepage and fluid-solid coupling stress sensitivity experiments under the conditions of actual gas reservoir pressure and temperature. And accordingly the effects of various fractures and caves on the gas invasion laws of gas reservoirs were analyzed. Finally, the method to predict the differentiation characteristics of water invasion influence of the reservoirs with different types of physical properties was developed based on the water invasion characteristics of typical carbonate gas reservoirs in the Sichuan Basin. And the following research results were obtained. First, in a broad sense, different types of carbonate reservoirs are classified as a triple continuum. The development of fractures speeds up the appearance of water invasion in gas reservoirs while the uniform development of caves slows down the appearance of water invasion effect. Second, the development of microfractures is a prerequisite for ultra-low porosity reservoirs to possess the ability of medium permeability or high permeability. The water invasion law in this case is obviously different from the channeling along large fractures or the water invasion in the network small fracture development belt. Third, the stress sensitivity of reservoir porosity in aquifer is the main source of formation water invasion energy. This characteristic is more prominent in the early stage of the exploitation of abnormal high pressure gas reservoirs. The research results have been applied to water invasion energy assessment, water invasion performance forecast and water control measure effectiveness prediction in a number of carbonate reservoirs in the Sichuan Basin. And they provide effective technical guidance for water invasion control in complex gas reservoirs and further understanding of water invasion differentiation laws. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 33

Main heading: Petroleum reservoir engineering

Controlled terms: Aquifers - Carbonation - Caves - Forecasting - Fracture - Gas permeability - Gases - Low permeability reservoirs - Porosity - Seepage - Solvents

Uncontrolled terms: Difference - Gas reservoir - Heterogeneous - Matching relationship - Mechanism analysis - Sichuan Basin - Triple continuum - Water invasion

Classification code: 444.2 Groundwater - 481.1 Geology - 512.1 Petroleum Deposits - 512.1.2 Petroleum Deposits : Development Operations - 802.2 Chemical Reactions - 803 Chemical Agents and Basic Industrial Chemicals - 931.2 Physical Properties of Gases, Liquids and Solids - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.06.009

Compendex references: YES

Database: Compendex

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183. Influence of sediment media with different particle sizes on the nucleation of gas hydrate

Accession number: 20183905863726

Authors: Zhang, Baoyong (1, 2); Zhou, Lihong (1, 2); Liu, Changling (3); Zhang, Qiang (1, 2); Wu, Qiang (1, 2); Wu, Qiong (1, 2); Liu, Chuanhai (1, 2)

Author affiliation: (1) College of Safety Engineering, Heilongjiang University of Science and Technology, Harbin; Heilongjiang; 150022, China; (2) National Central Laboratory of Hydrocarbon Gas Transportation Pipeline Safety, Harbin; Heilongjiang; 150022, China; (3) Qingdao Institute of Marine Geology, Qingdao; Shandong; 266071, China

Corresponding author: Zhang, Qiang(zq3946630@163.com)

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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

Number of references: 17

Main heading: Gas hydrates

Controlled terms: Capillarity - Distribution functions - Hydration - Liquefied gases - Nucleation - Particle size - Probability distributions - Sediments

Uncontrolled terms: Critical particle size - Different particle sizes - Hydrate bearing sediments - Induction time - Laboratory experiments - Nucleation induction - Pore - Sediment particle size

Classification code: 483 Soil Mechanics and Foundations - 522 Gas Fuels - 631.1 Fluid Flow, General - 922.1

Probability Theory - 933.1.2 Crystal Growth

DOI: 10.3787/j.issn.1000-0976.2018.05.018

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

184. Recommended revision of the Measurement of Natural Gas Flow by Ultrasonic Gas Flow Meters (GB/T 18604-2014)

Accession number: 20182905565478

Authors: Duan, Jiqin (1, 2, 3, 4); Li, Changjun (2); Zhou, Fang (1, 3, 4)

Author affiliation: (1) Natural Gas Research Institute, PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610213, China; (2) Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (3) CNPC Key Laboratory of Natural Gas Quality Control and Energy Measurement, Chengdu; Sichuan; 610213, China; (4) Chengdu Verification Branch, National Oil and Gas Large Flowrate Measurement Station, Chengdu; Sichuan; 610213, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

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Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Ultrasonic gas flow meters are widely applied to the metering of natural gas in production, transmission and marketing sectors owing to their advantages of high accuracy, high adaptability and high self-diagnostic capacity. They are used for the custody transfer metering during the China-Russia natural gas trade. To improve the custody transfer metering accuracy in natural gas trade and protect the legal economic benefits of both trading parties, three standards on ultrasonic gas flow meters (i.e., the international standard ISO 17089-1-2010, Russia's standard 8.611-2013 and China's standard GB/T 18604-2014) were comparatively analyzed from the aspects of application, gas quality condition, technical indicators, installation requirements and field measurement securities. Then, a metering test

was conducted on two ultrasonic gas flow meters that were installed in series, and the reproducibility of test data, the effect of installation sites on metering performance and the control limit of flow rate difference were analyzed. Accordingly, the recommendations were proposed on the revision of GB/T 18604-2014. It is indicated that GB/T 18604-2014 is basically consistent with the international standard in terms of main technical contents, but the former shall be strengthened in terms of quality control during the operation of ultrasonic gas flow meters. It is recommended to add GB/T 18604-2014 with an error limit of two calibrations of ultrasonic gas flow meters, the measurement error treatment method and the comparison method of ultrasonic gas flow meters installed in series that are included in ISO 17089-1-2010. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 7

Main heading: Flowmeters

Controlled terms: Commerce - Flow measurement - Flow of gases - Gas meters - Gases - Measurement errors - Natural gas - Natural gas fields - Quality control

Uncontrolled terms: Custody transfer - Diversity - Gas flow meters - GB/T 18604-2014 - ISO 17089-1-2010

Classification code: 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631.1 Fluid Flow, General - 631.1.2 Gas Dynamics - 913.3 Quality Assurance and Control - 943.1 Mechanical Instruments - 943.2 Mechanical Variables Measurements

DOI: 10.3787/j.issn.1000-0976.2018.01.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

185. Challenges and opportunities of CBM exploration and development in China under new situations

Accession number: 20185206284672

Title of translation:

Authors: Men, Xiangyong (1); Han, Zheng (1); Gong, Houjian (2); Wang, Yuyan (1)

Author affiliation: (1) Strategic Research Center of Oil & Gas Resources, Ministry of Land and Resources, Beijing; 100034, China; (2) China University of Mining and Technology, Beijing; 100083, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 10-16

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Under the new situation of speeding up energy transformation and ecological civilization construction in China, it is of great significance to study the challenges and opportunities faced during the exploration and development of coalbed methane (CBM) in China. In this paper, the CBM exploration and development status in China was introduced. Then, three major challenges and opportunities that domestic CBM industry is faced with under the new situation were analyzed and summarized. The three major challenges are as follows. First, CBM development cost is high and enterprise benefit is poor at low gas price, so enterprises are less confident with low investment initiative. Second, the internal factors that restrict the rapid development of CBM industry are that the occurrence conditions of CBM resources are complicated and existing development technologies cannot be popularized effectively. And third, the external factor impacting the development of CBM industry is that the management systems, mechanisms and policies of CBM industry are not suitable for its characteristics. The three major opportunities are as follows. First, the high-quality development of ecological civilization construction is a once-in-a-lifetime development opportunity for CBM development industry. Second, the basic conditions of CBM industry development are better in terms of CBM resource cognition, technological research and development experience. And third, the oil and gas structure reform policies that have been issued and are being formulated are favorable for promoting the healthy development of CBM industry. And accordingly, the following concurrent multiple measures and comprehensive policies were proposed. First, rapid CBM production increase should be realized with the southern area of the Qinshui Basin and the eastern margin of the Ordos Basin as two major industrial bases. Second, CBM exploration and development in deep layers and new areas should be strengthened to realize the rational construction layout of development test sites in the whole country. Third, technological research and quality management with single-well gas production improvement as the target should be

enhanced. And fourth, integrated management mechanism of CBM exploration and development should be explored.

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Number of references: 29

Main heading: Petroleum prospecting

Controlled terms: Coal bed methane - Coal deposits - Ecology - Firedamp - Investments - Methane - Oil wells - Quality management

Uncontrolled terms: China - Clean energy - Development technology - Exploration and development - Industrial development - Management policy

Classification code: 454.3 Ecology and Ecosystems - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds - 912.2 Management

DOI: 10.3787/j.issn.1000-0976.2018.09.002

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

186. Main reasons and preventive countermeasures for pipe sticking in shale-gas horizontal wells

Accession number: 20191306691389

Title of translation:

Authors: Sun, Yongxing (1, 2); Fan, Shenglin (1); Qiao, Lihua (1)

Author affiliation: (1) Drilling & Production Technology Research Institute, CNPC Chuanqing Drilling Engineering Co., Ltd., Guanghan; Sichuan; 618300, China; (2) Tourism School, Leshan Normal University, Leshan; Sichuan; 614000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 107-113

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: So far, shale gas of neritic facies above 3500 m in the Changning-Weiyuan National Shale Gas Demonstration Area of the Sichuan Basin has been developed beneficially on a large scale. With the extension of horizontal sections of shale-gas horizontal wells in this area, however, frictional drag and torque increase during the tripping in of pipe strings, which results in frequent hindering and sticking. In this paper, the reasons for sticking were analyzed. Then, bottom hole assembly (BHA) and drilling parameters influencing the wellbore trajectory and the concentration of cuttings in hole annulus were optimized from the point of view of preventing mechanical deformation of borehole during drilling and with the improvement of sealing performance of drilling fluid in the long horizontal sections of shale-gas horizontal wells as focus. Finally, the anti-sticking technologies and measures for shale-gas horizontal wells were formulated by optimizing casing program, wellbore trajectory and drilling fluid properties, combined with friction drag reduction and rate of penetration (ROP) improvement tools, and field application was conducted. And the following research results were obtained. First, the content of hazardous solid in water-based drilling fluid can be controlled effectively by adding an appropriate amount of composite salt inhibitor into it, combined with the application of solid control equipment. And the stability of oil-based drilling fluid can be enhanced by improving the oil-water ratio and increasing the quantity of emulsifier. Second, the maximum friction drag on drilling strings is decreased by 20% after the three-dimensional hole track design is optimized to be two dimensional. Third, based on the BHA with efficient bumper while drilling, combined with reasonable drilling parameters to control ROP, the cutting concentration satisfying the cutting carrying requirement of hole annulus can be reached and the thickness of cutting bed is reduced. Fourth, on-site application by 12 well times indicates that the time efficiency of complex accidents in horizontal sections (e.g. pipe hindering and sticking) decreases from 2.3% to 0.92%. In conclusion, the research results provide an important technological approach to solving the sticking in the long horizontal sections of shale gas horizontal wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Horizontal wells

Controlled terms: Application programs - Boreholes - Bottom-hole assembly - Control equipment - Drag - Drilling equipment - Drilling fluids - Emulsification - Friction - Gases - Hole concentration - Infill drilling - Oil well drilling - Oil wells - Shale gas

Uncontrolled terms: Changning-Weiyuan National Shale Gas Demonstration Area - Oil-based drilling fluid - Preventive countermeasure - Sichuan Basin - Water based drilling fluids

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 - 701.1 Electricity: Basic Concepts and Phenomena - 723 Computer Software, Data Handling and Applications - 732.1 Control Equipment - 802.3 Chemical Operations

Numerical data indexing: Percentage 2.00e+01%, Percentage 2.30e+00% to 9.20e-01%, Size 3.50e+03m

DOI: 10.3787/j.issn.1000-0976.2018.12.013

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

187. An improved FPPC algorithm for oil & gas pipeline segmentation by introducing an overlap index

Accession number: 20185006230380

Title of translation: FPPC

Authors: Luo, Zhengshan (1); Wang, Wenhui (1); Wang, Xiaowan (1); Zhang, Xinsheng (1)

Author affiliation: (1) School of Management, Xi'an University of Architecture and Technology, Xi'an; Shaanxi; 710055, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In order to divide a pipeline accurately and reasonably, specifically maintain pipeline segments with different risks and reduce the pipeline risk assessment cost, we proposed an improved fuzzy projection pursuit clustering algorithm (FPPC) for pipeline segmentation in this paper. In this method, the overlap index is introduced. A new projection index function which takes inter-class sparseness, overlap degree and intra-class compactness into account was constructed with the data class characteristics of the pipeline sample set as the beginning point. Based on this, an improved FPPC algorithm segmentation model was established. Finally, the pipeline segmentation result of the improved FPPC algorithm was compared with that of traditional FPPC algorithm with the segmentation of one gas pipeline in China as an example. And the following research results were obtained. First, when the improved FPPC model is adopted, the subjective defects of traditional model (e.g. stochastic and fuzzy) are overcome while the corresponding pipeline risk level standard is not needed. In this improved FPPC model, the pipeline is divided into 4 classes, which is more reasonable and accurate. Second, by virtue of the designed projection index function, the sub-classes of the pipeline samples can be identified and the clustering accuracy and reliability of pipeline segmentation are improved. Third, compared with the projection pursuit clustering (PPC) algorithm and the traditional FPPC algorithm, the improved FPPC algorithm has a higher convergence rate and less iteration. In conclusion, the research results provide a more scientific method for pipeline segmentation, as well as a theoretical basis for oil & gas pipeline risk assessment. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Clustering algorithms

Controlled terms: Chemical analysis - Iterative methods - Pipelines - Risk analysis - Risk assessment - Stochastic models - Stochastic systems

Uncontrolled terms: Clustering accuracy - Fuzzy projection - Overlap index - Pipeline risk assessment - Projection indices - Projection pursuits - Segmentation models - Segmentation results

Classification code: 619.1 Pipe, Piping and Pipelines - 903.1 Information Sources and Analysis - 914.1 Accidents and Accident Prevention - 921.6 Numerical Methods - 922 Statistical Methods - 922.1 Probability Theory - 961 Systems Science

DOI: 10.3787/j.issn.1000-0976.2018.08.015

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

188. Development characteristics and shale gas exploration potential of the Lower Carboniferous black shale in the Guizhong Depression

Accession number: 20185106260091

Title of translation:

Authors: Hu, Dongfeng (1); Wei, Zhihong (1); Liu, Ruobing (1); Fan, Zhiwei (1); Han, Jing (1)

Author affiliation: (1) Sinopec Exploration Company, Chengdu; Sichuan; 610041, China

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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: The Carboniferous shale in the Guizhong Depression of central Guangxi presents good exploration potential of shale gas, but its exploration effectiveness is restricted by the unclear distribution, quality and potential of high-quality shale. In this paper, the Lower Carboniferous Luzhai shale was taken as the research object in order to guide the exploration of Carboniferous shale gas in the Guizhong Depression. Based on the field outcrops, well drilling, well logging and test data of the Guizhong Depression and its surrounding areas, the shale formation was studied systematically based on the characteristics of distribution, organic geochemistry and reservoir, and the preservation conditions. Then, the development characteristics of black shale were confirmed and the distribution laws of high-quality shale were summarized. Finally, shale gas exploration was analyzed and the favorable exploration areas were defined. And the following research results were obtained. First, the Luzhai Fm shale in the Guizhong Depression is mainly carbonaceous shale and siliceous shale of deepwater continental shelf facies. Second, the high-quality Luzhai shale is 20-60 m thick and it is characterized by high total organic carbon, good type of organic matters, moderate maturity of organic matter, high content of brittle minerals, good reservoir property and developed pores of organic matters. Third, regional caprocks and roofs & floors are well developed in the Liucheng Slope and the Yishan Sag. They are weakly deformed, suffer from less uplift and denudation, and are far away from the strong strike-slip reverse fault, so they have good preservation conditions. Fourth, shallow wells which were drilled in the surface structures of the Guizhong Depression in the early stage present abundant gas shows, and most of them produce gas flow, which reveals a promising prospect of shale gas exploration in this area. In conclusion, the wide and gentle synclines with large burial depth in the Liucheng Slope and the Yishan Sag are the favorable areas for shale gas exploration in the Guizhong Depression. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Carbonaceous shale

Controlled terms: Biogeochemistry - Biological materials - Fault slips - Flow of gases - Gases - Geological surveys - Infill drilling - Offshore gas fields - Organic carbon - Organic minerals - Petroleum prospecting - Shale - Shale gas - Strike-slip faults - Well drilling - Well logging

Uncontrolled terms: Favorable exploration area - Gas exploration - Geochemical characteristic - Guizhong depression - Luzhai Fm of Lower Carboniferous - Preservation condition - Thickness

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 483 Soil Mechanics and Foundations - 484.1 Earthquake Measurements and Analysis - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631.1.2 Gas Dynamics - 804.1 Organic Compounds

Numerical data indexing: Size 2.00e+01m to 6.00e+01m

DOI: 10.3787/j.issn.1000-0976.2018.10.004

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

189. An optimal design of crushing parameters of Marine gas hydrate reservoirs in solid fluidization exploitation

Accession number: 20185106260099

Title of translation:

Authors: Wang, Guorong (1); Huang, Rong (1); Zhong, Lin (1); Wang, Leizhen (1); Zhou, Shouwei (2, 3); Liu, Qingyou (3, 4)

Author affiliation: (1) School of Mechatronic Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) China National Offshore Oil Corporation, Beijing; 100010, China; (3) State Key Laboratory of Oil & Gas Reservoir Geology and Development Engineering, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (4) MOE Key Laboratory for Fluid Machinery and Power Machinery, Xihua University, Chengdu; Sichuan; 610039, China

Corresponding author: Huang, Rong(huangr7679@163.com)

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: To select reasonable excavating and crushing process parameters and nozzle structure parameters is one of the key factors to realize commercial excavation of marine natural gas hydrate (hereinafter "hydrate" for short) in solid fluidization exploitation. For analyzing the factors influencing jet crushing efficiency of hydrate in actual engineering, nozzle diameter, pump pressure and other parameters were simulated and analyzed in $k\text{-}\epsilon$ turbulence model based on the laboratory experiments and the field production test data at Liwan 3 Station in the northern South China Sea with a gas production rate of 12×10^4 m³/d as the target of commercial hydrate exploitation. And the following research results were obtained. First, the relationship curves of nozzle diameter, pump pressure and displacement are determined when the critical jet speed for crushing hydrate is 24 m/s. Second, the crushing rate to satisfy the daily hydrate sediment excavation of commercial exploitation is 2.48 m³/min and its corresponding jet crushing diameter is 800 mm. Third, when the nozzle diameter is fixed, other parts in the process will be damaged if jet displacement and pump pressure are increased directly. In conclusion, these selected design parameters for commercially excavating and crushing marine non-diagenetic hydrate by means of solid fluidization are conducive to the optimal design of crushing parameters of hydrate in solid fluidization exploitation. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Gas hydrates

Controlled terms: Crushing - Excavation - Fluidization - Hydration - Natural gas - Nozzle design - Nozzles - Optimal systems - Pumps - Turbulence models

Uncontrolled terms: Crushing rates - Displacement - Fluent - Optimal design - Pump pressures - Water jets

Classification code: 408 Structural Design - 522 Gas Fuels - 618.2 Pumps - 802.3 Chemical Operations - 961 Systems Science

Numerical data indexing: Size 8.00e-01m, Velocity 2.40e+01m/s

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Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

190. Research and development of the toe fracturing sliding sleeve technology for deep-seated shale gas wells with long horizontal sections

Accession number: 20185006230373

Title of translation:

Authors: Shuai, Chungang (1); Ma, Huiyun (1); Wei, Wei (1); Yu, Chenggang (1); Mou, Naiqu (2); Liu, Wang (2)

Author affiliation: (1) Research Institute of Engineering and Technology, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610017, China; (2) Sichuan Changning Natural Gas Development Co., Ltd., Yibin; Sichuan; 644005, China

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: For breaking the foreign technical monopoly and solve the technical problems in the first stage of reservoir stimulation in deep-seated shale gas wells with long horizontal sections in China, structural design, indoor experiment & evaluation and matching cementing technology study were conducted after the application environment and construction requirements were confirmed. Accordingly, a toe fracturing sliding sleeve which meets the requirements of high temperature and high pressure cementing and high flow-rate fracturing was developed and then tested on site at Well Changning H7-5 in the Changning-Weiyuan National Shale Gas Demonstration Area, Sichuan Basin. And the following research results were obtained. First, this independently developed toe fracturing sliding sleeve can be opened by applying pressure to the wellhead, and thus the passage for Stage I fracturing or pumping is formed to substitute the Stage I perforation of coiled tubing. Second, the toe fracturing sliding sleeve adopts the design of special inner surface coating, the upgoing opening structure of inner sliding sleeve and the temporary plugging design of frac sand jet orifice, which can improve the adaptability of the sleeve to cementing environment and reduce the effect of cement on the normal opening of the sleeve. Third, the opening of the toe fracturing sliding sleeve depends on the breaking of rupture disks, which can improve its opening accuracy and ensure its accurate opening at high temperature and high pressure (HTHP). In conclusion, this independently developed toe fracturing sliding sleeve is advantageous with stable and reliable performance, convenient operation and high opening accuracy, and its indicators all meet the design and construction requirements of cementing and fracturing of shale gas horizontal wells, so it can increase the construction efficiency and reduce construction risk and cost. Furthermore, it presents the promising prospect of popularization and application in Stage I reservoir stimulation of deep-seated shale gas wells with long horizontal sections. And it is also of great practical significance to the beneficial development of deep shale gas reservoirs. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 10

Main heading: Horizontal wells

Controlled terms: Cements - Coiled tubing - Fracture - Gases - Natural gas wells - Oil well cementing - Petroleum reservoir evaluation - Petroleum reservoirs - Rupture disks - Shale gas - Structural design - Well stimulation

Uncontrolled terms: Beneficial development - Cement sheath - Deep layer - Horizontal section - Sliding sleeves

Classification code: 408.1 Structural Design, General - 412.1 Cement - 512 Petroleum and Related Deposits - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.08.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

191. A selective formulated solvent based on steric hindered amine applied to tail gas treatment

Accession number: 20185106260103

Title of translation:

Authors: Xiong, Gang (1); Yang, Zihai (2); He, Jinlong (1); Li, Fuyuan (3); Jiang, Jiqiang (4); Hu, Tianyou (1); Li, Xiaoyun (1); Yang, Chaoyue (1)

Author affiliation: (1) Research Institute of Natural Gas Technology, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610213, China; (2) Chuanzhong Division of PetroChina Southwest Oil & Gasfield Company, Suining; Sichuan; 610041, China; (3) Longgang Natural Gas Purification Plant, Chuanzhong Division of PetroChina

Southwest Oil & Gasfield Company, Suining; Sichuan; 634000, China; (4) Chongqing Natural Gas Purification Plant General, PetroChina Southwest Oil & Gasfield Company, Chongqing; 430001, China

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Document type: Journal article (JA)

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Abstract: Due to the MDEA's unsatisfactory desulfurization performance at low pressures, which leads to the increase of SO₂ concentration in tail gas release, a formulated solvent based on steric hindered amine (SHA) was thus developed, in virtue of SHA's good absorbing activity with H₂S and lower reacting inclination with CO₂. This solvent was applied first to a pilot plant with the capacity of 10 thousand m³/d and then formally to the Claus hydrogenation tail gas desulfurization units in the Longgang Natural Gas Purification Plant operated by the PetroChina Southwest Company. During this solvent's industrial application time, its absorbing performance was evaluated under different conditions such as numbers of contact plates of the absorbing tower, lean amine temperatures into the absorbing tower, amine cycling amounts, etc., based on which the operating parameters were optimized. In addition, the recycling of desulfurizing solutions was examined and the favorable operating parameters were determined. After one year's application, the following findings were achieved. With this solvent in treatment, the H₂S content in the desulfurized tail gas (originally, there was 0.77-3.96% H₂S and 23.91-32.79% CO₂), was reduced to less than 30 mg/m³, and by 58.45% compared to the MDEA previously used in this desulfurization plant. The rich amine solution can be easily regenerated with both H₂S and CO₂ content less than 0.12 g/L in the regenerated lean amine stream. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Desulfurization

Controlled terms: Air purification - Carbon dioxide - Emission control - Gases - Natural gasoline plants - Pilot plants - Solvents

Uncontrolled terms: Amine solutions - Contact plates - Desulfurization plant - Hydrogen reduction - Operating parameters - Regenerative performance - SO₂ emissions - Tail gas

Classification code: 451.2 Air Pollution Control - 513.2 Petroleum Refineries - 803 Chemical Agents and Basic Industrial Chemicals - 804.2 Inorganic Compounds

Numerical data indexing: Mass_Density 1.20e-01kg/m³, Mass_Density 3.00e-05kg/m³, Percentage 5.85e+01%

DOI: 10.3787/j.issn.1000-0976.2018.10.016

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

192. Optimization of platform positioning considering the learning effect in the "well factory" mode

Accession number: 20182905565477

Authors: Wang, Zhiyue (1); Gao, Deli (1); Diao, Binbin (1); Hu, Degao (2)

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

Corresponding author: Gao, Deli(gaodeli@cup.edu)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 1

Issue date: January 25, 2018

Publication year: 2018

Pages: 102-108

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: With the promotion and application of the "well factory" technique, the learning effect generated under the "well factory" mode plays an important role in the selection and optimization of well quantity and platform position. Combined with the learning curves of "well factory" drilling, the concept of "learning index of drilling" was proposed to quantify the reduced drilling costs versus the number of wells on the platform under the "well factory" mode. Considering the impacts of "learning index of drilling", the maximum capacity of platform and trajectory complexity on the selection of platform position, the optimized model for platform positioning for cluster wells under the "well factory" mode was built. In accordance with the genetic algorithm (GA) principles and with consideration to the correspondence of one well to one platform and the maximum allowable number of wells on one platform, the GA factors were modified. Then, the procedures for the solution of the proposed model were proposed, and calculations were made for two example cases. The results are revealed in two aspects. First, under the "well factory" mode, learning effect, platform capacity, trajectory complexity and other factors may significantly affect platform positioning of cluster horizontal wells and relevant drilling costs. Second, the optimized model can effectively minimize the number of platforms required, enhance the number of wells on one platform and cut down relevant drilling costs under all given constraints. The optimized model with consideration to the learning effect in the "well factory" mode can fully extend the advantages of "well factory", thus it is an effective technique to minimize the costs of constructing cluster horizontal wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21**Main heading:** Horizontal wells**Controlled terms:** Costs - Directional drilling - Drilling platforms - Genetic algorithms - Infill drilling - Shale - Shale gas**Uncontrolled terms:** Cluster well - Drilling cost - Learning curves - Learning effects - Optimized models - Selection and optimizations - Well constructions**Classification code:** 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 522 Gas Fuels - 911 Cost and Value Engineering; Industrial Economics**DOI:** 10.3787/j.issn.1000-0976.2018.01.013**Compendex references:** YES**Database:** Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

193. Effect of wax crystal precipitation on the kinetic characteristics of hydrate formation

Accession number: 20183805830751**Authors:** Zhou, Shidong (1); Yu, Xuewei (1); Jiang, Kun (1); Yu, Xiaolin (2); Bian, Hui (1); Chen, Xiaokang (1)**Author affiliation:** (1) Jiangsu Key Laboratory of Oil-Gas Storage and Transportation Technology//School of Petroleum Engineering, Changzhou University, Changzhou; Jiangsu; 213016, China; (2) No.9 Oil Production Plant, PetroChina Changqing Oilfield Company, Yinchuan; Ningxia; 750000, China**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 3**Issue date:** March 25, 2018**Publication year:** 2018**Pages:** 103-109**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency**Number of references:** 23**Main heading:** Gas hydrates**Controlled terms:** Gases - Growth rate - Heptane - High pressure effects - Hydrates - Hydration - Kinetics - Nucleation - Petroleum transportation - Pipelines - Temperature**Uncontrolled terms:** Gas consumption - Gas consumption rate - Kinetic characteristics - n-Heptanes - Pipeline blockages - Wax crystals**Classification code:** 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 641.1 Thermodynamics - 804.1 Organic Compounds - 931 Classical Physics; Quantum Theory; Relativity - 933.1.2 Crystal Growth

Numerical data indexing: Percentage 3.30e+00%, Percentage 5.69e+01%, Pressure 3.50e+06Pa, Temperature 2.74e+02K

DOI: 10.3787/j.issn.1000-0976.2018.03.013

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

194. Popularization and application of capillary foam deliquification technology in horizontal wells with low pressures and low liquid production rates: a case study on middle–shallow gas reservoirs in the western sichuan depression

Accession number: 20183905879913

Authors: Liu, Tong (1); Zhou, Xingfu (2); Chen, Hailong (1); Lu, Guangliang (2); Zhao, Zhejun (1); Liu, Dayong (2); Du, Yang (1)

Author affiliation: (1) Petroleum Engineering Technology Institute, Sinopec Southwest Oil and Gas Branch, Deyang; Sichuan; 618000, China; (2) No.1 Gas Production Plant, Sinopec Southwest Oil and Gas Branch, Deyang; Sichuan; 618000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 83-90

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ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 16

Main heading: Injection (oil wells)

Controlled terms: Gas industry - Gases - Horizontal wells - Liquids - Natural gas well production - Petroleum reservoirs - Pressure measurement - Suspensions (fluids) - Well stimulation

Uncontrolled terms: Bottom hole - Capillary - Deliquification - Sichuan Basin - Sticking prevention - Western Sichuan

Classification code: 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 804 Chemical Products Generally - 944.4 Pressure Measurements

Numerical data indexing: Volume 1.04e+02m³

DOI: 10.3787/j.issn.1000-0976.2018.06.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

195. CBM ground gathering and transportation technologies in the Qinshui Basin: Status and prospect

Accession number: 20183905863722

Authors: Meng, Fanhua (1); Ma, Wenfeng (1); Liu, Hongxia (1); Cheng, Xiangzhen (2); Han, Dong (1); Shi, Liping (1)

Author affiliation: (1) Shanxi CBM Exploration and Development Branch of PetroChina, Changzhi; Shanxi; 046000, China; (2) Science and Technology Information Office of PetroChina Huabei Oilfield Company, Renqiu; Hebei; 062552, China

Corresponding author: Ma, Wenfeng(yjzx_mwf@petrochina.com.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: May 25, 2018

Publication year: 2018

Pages: 118-124

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 16

Main heading: Construction equipment

Controlled terms: Coal bed methane - Coal deposits - Cost reduction - Efficiency - Integration - Methane - Natural gas wells - Pipelines - Productivity

Uncontrolled terms: Cost reduction and efficiencies - Ground-underground - Qinshui basin - Skid-mounted - Technology optimization - Transportation capacity - Transportation technology - Well pattern arrangements

Classification code: 405.1 Construction Equipment - 503 Mines and Mining, Coal - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 619.1 Pipe, Piping and Pipelines - 804.1 Organic Compounds - 913.1 Production Engineering - 921.2 Calculus

DOI: 10.3787/j.issn.1000-0976.2018.05.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

196. Development and field application of a pulse–jet hydraulic impactor

Accession number: 20183905863718

Authors: Li, Wei (1); Li, Shichang (1); Yan, Lipeng (2); Qin, Dong (3); Sun, Shihui (1); Zhao, Huan (1)

Author affiliation: (1) College of Petroleum Engineering, Northeast Petroleum University, Daqing; Heilongjiang; 163318, China; (2) Sinopec Research Institute of Petroleum Engineering, Beijing; 100101, China; (3) No.9 Oil Production Plant, PetroChina Daqing Oilfield Company, Daqing; Heilongjiang; 163000, China

Corresponding author: Li, Shichang(1348238630@qq.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: May 25, 2018

Publication year: 2018

Pages: 87-93

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The current studies on hydraulic pulse jet mainly focus on the pulse jet flow field and its effect, but have never extended to the collaboration of hydraulic impact and pulse jet for rock breaking. In this paper, both hydraulic impact and pulse jet were combined effectively to develop a pulse–jet hydraulic impactor for drilling after analyzing the working principles and realization conditions. The rock breaking capacity of this tool was verified through laboratory experiments and field tests. The following results were obtained. First, the tool can run when the mass of the impactor body is less than 60 kg. Second, the rock breaking capacity of the drilling assembly under the synergistic action of hydraulic impact and pulse jet is obviously better than that of other drilling tools, and the tool is much more efficient than other tools in ROP enhancement. Third, the impact effect is dependent on the mass and impact frequency of the impactor and the impactor with the mass of 30 kg is better in impact effect. Fourth, the larger the impulse jet, the higher its rock breaking capacity is. The pulse jet can be increased by reducing the diameter of the tool's nozzle. Fifth, hydraulic impact can help accelerate the breaking of high-hardness rocks, and the breaking of less-cemented rocks can be greatly enhanced by increasing the pulse jet. Field application results show that the ROP of the drilling tool based on the collaboration of hydraulic impact and pulse jet is 2.52 m/h, which is 72.5% higher than that of conventional drilling assemblies. It is concluded that this developed pulse–jet hydraulic impactor provides a new idea to solve the problems in deep wells and horizontal wells, such as low drilling speed, obvious chip hold down effect and difficult cuttings removal. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Hydraulic tools

Controlled terms: Horizontal wells - Infill drilling - Rocks

Uncontrolled terms: Drilling tool - Field test - Hydraulic impacts - Laboratory experiments - Pulse jet - Rock breaking

Classification code: 511.1 Oil Field Production Operations - 512.1.1 Oil Fields - 605.1 Small Tools, Powered

Numerical data indexing: Mass 3.00e+01kg, Mass 6.00e+01kg, Percentage 7.25e+01%

DOI: 10.3787/j.issn.1000-0976.2018.05.010

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

197. Reservoir stability in the process of natural gas hydrate production by depressurization in the Shenhu area of the South China Sea

Accession number: 20183905876135

Authors: Wan, Yizhao (1, 2); Wu, Nengyou (1, 2); Hu, Gaowei (1, 2); Xin, Xin (3); Jin, Guangrong (4); Liu, Changling (1, 2); Chen, Qiang (1, 2)

Author affiliation: (1) MLR Key Laboratory of Gas Hydrate, Qingdao Institute of Marine Geology, Qingdao; Shandong; 266071, China; (2) Laboratory for Marine Mineral Resources, Qingdao National Laboratory for Marine Science and Technology, Qingdao; Shandong; 266071, China; (3) College of Environment and Resources, Jilin University, Changchun; Jilin; 130012, China; (4) Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences, Guangzhou; Guangdong; 510640, China

Corresponding author: Wu, Nengyou(wuny@ms.giec.ac.cn)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: April 25, 2018

Publication year: 2018

Pages: 117-128

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 30

Main heading: Natural gas fields

Controlled terms: Gas hydrates - Hydration - Mass transfer - Mathematical transformations - Natural gas - Stability

Uncontrolled terms: Depressurizations - Effective stress - Multi-field coupling - Shenhu area - South China sea

Classification code: 512.2.1 Natural Gas Fields - 522 Gas Fuels - 641.3 Mass Transfer - 921.3 Mathematical Transformations

DOI: 10.3787/j.issn.1000-0976.2018.04.014

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

198. An abnormality of productivity indicative curves for multi-layer gas wells: Reason analysis and a correction method

Accession number: 20183805830744

Authors: Shi, Juntao (1); Li, Qian (2); Zhang, Lei (3); Sun, Xiaohui (4); Sun, Zheng (1); Liu, Shuai (1)

Author affiliation: (1) MOE Key Laboratory of Petroleum Engineering//China University of Petroleum, Beijing; 102249, China; (2) Research Institute of Exploration and Development, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (3) Research Institute, Shaanxi Yanchang Petroleum Co., Ltd., Xi'an; Shaanxi; 710075, China; (4) PetroChina Tarim Oilfield Company, Korla; Xinjiang; 841000, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Issue date: March 25, 2018

Publication year: 2018

Pages: 50-59

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: An abnormality tend to occur in the productivity indicative curves in the process of productivity test interpretation of multi-layer gas wells, resulting in the failure of solutions to their productivity equations and absolute open flow rates. To figure out the reasons for such an abnormality, we established a full-hole calculation model considering the coupling of wellbore variable mass flows and reservoir seepages to calculate a gas production profile and wellbore pressure distribution of a multi-layer productive gas reservoir. Then, based on the analysis of the gas production profile and wellbore pressure distribution characteristics of gas wells at different gas production rates, the root cause of the abnormality in the productivity indicative curves of multi-layer gas wells was analyzed, and a corresponding correction method was proposed and validated based on some examples. And the following research results were obtained. First, there are two reasons for the abnormal productivity indicative curves of multi-layer gas wells. On the one hand, there is a variable mass pipe flow in the wellbore of multi-layer sections and a flowing pressure gradient decreases with the increase of well depth. And the flowing pressure in the middle of the reservoir which is converted based on the flowing pressure gradient above the pressure gauge is higher than the real value. On the other hand, the pressure in the multi-layer producing sections doesn't realize a balance after well shutdown for a short time, so the measured static pressure is greater than the one measured when the pressure of each layer gets balanced after well shutdown for a long time. Second, the flowing pressure obtained from the productivity test interpretation of multi-layer gas producer shall be converted based on the pressure measured by the pressure gauge within 200 m above the reservoir top and it is necessary to adopt the static pressure measured after the balance of wellbore pressure. Third, the reliability of the model, the rationality of the abnormality reason analysis and the validity of the correction method are verified based on calculation examples and cases. It is concluded that the research results provide a technical support for the productivity evaluation of multi-layer gas wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 23

Main heading: Natural gas well production

Controlled terms: Boreholes - Electromagnetic wave attenuation - Gas producers - Gases - Mass transfer - Natural gas wells - Oil field equipment - Petroleum reservoir evaluation - Petroleum reservoirs - Pressure distribution - Pressure gages - Pressure gradient - Productivity - Reliability analysis

Uncontrolled terms: Commingling - Flowing pressures - Gas reservoir - Indicative curve - Static pressure - Variable mass flow

Classification code: 511.2 Oil Field Equipment - 512 Petroleum and Related Deposits - 522 Gas Fuels - 641.3 Mass Transfer - 711 Electromagnetic Waves - 931.1 Mechanics - 944.3 Pressure Measuring Instruments - 944.4 Pressure Measurements

Numerical data indexing: Size 2.00e+02m

DOI: 10.3787/j.issn.1000-0976.2018.03.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

199. Three typical types of shale gas preservation in the Fuling Shale Gas Field, Sichuan Basin

Accession number: 20183805830742

Authors: Shu, Yi (1); Lu, Yongchao (1); Bao, Hanyong (2); Wang, Chao (2); Liu, Zhanhong (1)

Author affiliation: (1) Faculty of Earth Resource, China University of Geosciences(Wuhan), Wuhan; Hubei; 430074, China; (2) Research Institute of Exploration and Development, Sinopec Jiangnan Oilfield Company, Wuhan; Hubei; 430223, 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 primary quality of shale in the Fuling Shale Gas Field, Sichuan Basin, is areally less different, but the gas production rates vary greatly from different development wells. This is resulted from the areal difference of shale gas preservation conditions. For a quantitative evaluation of shale preservation conditions in this area, the structural characteristics of this field (e.g. the force applied on the structure, and structural form and fracture development degree) were analyzed comprehensively and the structural types were classified based on the detailed structure interpretation results, together with geological, well logging and gas well testing data. Then, based on the single-well testing production of shale gas, the main indexes influencing the preservation conditions of marine shale gas of the Upper Ordovician Wufeng-Lower Silurian Longmaxi Fms in this area were studied from the macroscopic and microscopic aspects. And finally, the preservation types were classified according to the determined evaluation indexes. The following research results were obtained. First, the structures in the Fuling Shale Gas Field can be divided into a stable type, a weakly-deformed type and a complex type. Second, the following 6 parameters are taken as the evaluation indexes of shale gas preservation conditions in this area, including structural form, fracture characteristic, roof and floor condition, formation pressure, porosity and pore size. Third, gentle morphological structures and major structures far from the boundary are the base of shale gas preservation. The effective barrier and roof & floor sealing can significantly reduce the damage of structural reworking to gas reservoirs. Overpressure environment, porosity and pore size are the comprehensive representations of preservation conditions. And fourth, three types of structures correspond to three typical types of shale gas preservation respectively, among which a stable structure is the most favorable one. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 24

Main heading: Shale gas

Controlled terms: Floors - Fracture testing - Gas industry - Gases - Natural gas well production - Petroleum reservoir evaluation - Petroleum reservoirs - Pore size - Roofs - Well logging - Well testing

Uncontrolled terms: Evaluation index - Fuling Shale Gas Field - Late Ordovician - Sichuan Basin - Silurian - Structural type

Classification code: 402 Buildings and Towers - 512 Petroleum and Related Deposits - 522 Gas Fuels - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.03.004

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

200. Distribution laws of large gas fields and further exploration orientation and targets in China

Accession number: 20183905876123

Authors: Wei, Guoqi (1); Li, Jun (1); She, Yuanqi (1); Zhang, Guangwu (1); Shao, Liyan (1); Yang, Guiru (1); Guan, Hui (1); Yang, Shen (1); Lin, Jie (1); Wang, Rong (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China

Corresponding author: Li, Jun(lijun69@petrochina.com.cn)

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Issue date: April 25, 2018

Publication year: 2018

Pages: 12-25

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: With the rapid expansion and extension of natural gas exploration and development, it is more and more difficult to discover large-scale reserves in China. To intensify the research on new natural gas exploration domains, we reviewed the progress and trend of natural gas exploration and analyzed the main areas with large-scale proved gas in place (GIP). Then, based on a statistic analysis of large gas fields in China as well as their hydrocarbon accumulation characteristics, their genetic systems were classified and each system's distribution law was also identified. Some research results were obtained. First, carbonate paleo-uplifts of cratonic basins, tight sandstones of extensive gentle slopes and thrust structures of foreland basins are the main areas with large-scale proved GIP in China. Second, there are five genetic systems for large gas fields, i. e. cratonic rift and paleo-uplift, stable slope of low-angle open lake, thrust structure of piedmont fault depression, faulted uplift and igneous rock of intracontinental pull-apart fault depression, and anticline structure of epicontinental strike-slip fault depression, and one genetic system for unconventional gas, i. e. adsorption and accumulation in nano-scale space. Third, there is one core genetic system for large conventional gas fields in each geologic cycle. Fourth, two-level accumulation, i. e. no migration inside the source and large-scale transportation termination, exists in each single genetic system, and sequential accumulation is formed under the control of multiple factors in the areas where multiple genetic systems are superimposed. Fifth, the multi-system superimposed area is rich in large gas fields and the multi-stress hinge zone in the central area is the natural gas convergence zone. Finally, the future orientation and targets of natural gas exploration in China were pointed out. First, the cratonic rift and paleo-uplift system includes Sinian-Lower Paleozoic in the Sichuan Basin, Cambrian in the Tarim Basin and Cambrian-Ordovician in the Ordos Basin. Second, the thrust structure of piedmont fault depression system includes the transform zone of Kuqa thrust structure, the northwestern Sichuan Basin and the southwestern Tarim Basin. Third, the anticline structure of epicontinental strike-slip fault depression system includes the basins in the eastern China seas. Fourth, the adsorption and accumulation in nano-scale space system includes organic-rich shales in South China and deep coal beds in the Ordos Basin in central China. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 45

Main heading: Natural gas fields

Controlled terms: Adsorption - Coal deposits - Confined flow - Fault slips - Gas industry - Gases - Geological surveys - Igneous rocks - Landforms - Metamorphic rocks - Nanotechnology - Natural gas - Proven reserves - Strike-slip faults

Uncontrolled terms: Anticline structure - China - Distribution law - Large gas field - Nano scale - New area - Paleo-uplift - Thrust structures

Classification code: 481.1 Geology - 484.1 Earthquake Measurements and Analysis - 503 Mines and Mining, Coal - 512.1.2 Petroleum Deposits : Development Operations - 512.2.1 Natural Gas Fields - 522 Gas Fuels - 631.1 Fluid Flow, General - 761 Nanotechnology - 802.3 Chemical Operations

DOI: 10.3787/j.issn.1000-0976.2018.04.002

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

201. An evaluation method of engineering sweet spots of shale gas reservoir development: A case study from the Jiaoshiba Gas Field, Sichuan Basin

Accession number: 20182905565429

Authors: Liao, Dongliang (1, 2); Lu, Baoping (1, 2)

Author affiliation: (1) State Key Laboratory of Shale Oil and Gas Enrichment Mechanisms and Effective Development, Beijing; 100101, China; (2) Sinopec Research Institute of Petroleum Engineering, Beijing; 100101, China

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Publication year: 2018

Pages: 43-50

Language: Chinese

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The quantitative evaluation of engineering sweet spots in shale gas reservoir development provides important reference for forecast on difficulties and costs in such projects. In this paper, the Jiaoshiba Shale Gas Field

in the Sichuan Basin was taken as an example to search for a high-precision quantitative engineering sweet spot evaluation method. Firstly, the effects of engineering sweet spot parameters (e.g. brittleness index, stress difference coefficient, shale content and fracture pressure) on fracturing sand volume and fluid volume were qualitatively analyzed. Then, a quantitative analysis was conducted by means of the correlation coefficient to determine principal engineering sweet spot parameters and the corresponding target evaluation indexes which characterize shale gas reservoir development. Finally, such shale gas engineering sweet spots were evaluated based on three models (i.e., single parameter model, radar area model and independence weight coefficient model) and the evaluation results were compared. The following research results were obtained. First, shale content, brittleness index, calcareous content and stress difference coefficient are the main engineering sweet spot parameters. Second, the multi-target evaluation problem, which occurs when the engineering sweep spot is characterized by using sand volume and fluid volume, can be avoided effectively by characterizing the engineering sweet spots by means of sand carrying ratio. Third, the evaluation precision of engineering sweet spots is the highest in the independence weight coefficient model, secondary in the radar area model and the lowest in the single parameter model. Field application effects in three fracturing wells also show that the quantitative evaluation result of engineering sweet spots in shale formations by the independence weight coefficient model is reliable. To sum up, it is appropriate to adopt the independence weight coefficient model to quantitatively evaluate the engineering sweet spots in shale gas reservoir development. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 20

Main heading: Cost engineering

Controlled terms: Brittleness - Fracture - Fracture mechanics - Gas engineering - Gas industry - Gases - Parameter estimation - Petroleum reservoir evaluation - Petroleum reservoirs - Plasticity - Precision engineering - Radar - Sand - Shale - Shale gas

Uncontrolled terms: Brittleness index - Fracture pressures - Gas fields - Ground stress - Sichuan Basin - Sweet spot

Classification code: 483.1 Soils and Soil Mechanics - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 716.2 Radar Systems and Equipment - 911 Cost and Value Engineering; Industrial Economics - 931.1 Mechanics - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.02.006

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

202. Technological series supporting the "green-development" of shale gas in China: A case study

Accession number: 20182905565440

Authors: Wang, Qiang (1); Zhu, Dongchang (1); Xia, Guoyong (1); Zeng, Guang (1); Li, Xiaobin (2); Chen, Hu (1); Wei, Lai (1); Liu, Yuzhou (1)

Author affiliation: (1) Development Division of PetroChina Southwest Oil and Gas Field Company, Chengdu; Sichuan; 610051, China; (2) Chongqing Division of PetroChina Southwest Oil and Gas Field Company, Chongqing; 430040, China

Corresponding author: Zhu, Dongchang(zhudongc@petrochina.com.cn)

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Language: Chinese

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CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Number of references: 15

Main heading: Environmental management

Controlled terms: Debris - Drilling fluids - Environmental technology - Flow of fluids - Fracturing fluids - Gases - Infill drilling - Noise abatement - Oil field development - Petroleum reservoir evaluation - Sewage - Shale gas - Waste disposal - Waste utilization - Water recycling - Well stimulation

Uncontrolled terms: Commercial productions - Cyclic utilizations - Environmental damage - Environmental risk sources - Environmentally-friendly technology - Flow back - Gas development - Water and soil loss
Classification code: 452.1 Sewage - 452.4 Industrial Wastes Treatment and Disposal - 454 Environmental Engineering - 511.1 Oil Field Production Operations - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 631.1 Fluid Flow, General - 751.4 Acoustic Noise
DOI: 10.3787/j.issn.1000-0976.2018.02.017
Compendex references: YES
Database: Compendex
Compilation and indexing terms, Copyright 2019 Elsevier Inc.
Data Provider: Engineering Village

203. Natural gas fueling the world's future: A brief summary from the 27th World Gas Conference (WGC)

Accession number: 20185206284671

Title of translation: —27WGC

Authors: Li, Luguang (1); Wang, Hongyan (2); Liu, He (2); Li, Qun (1); Zhang, Leifu (2)

Author affiliation: (1) PetroChina Company Limited, Beijing; 100007, China; (2) Petro China Research Institute of Petroleum Exploration & Development, Beijing; 100007, China

Corresponding author: Li, Luguang(liluguang@petrochina.com.cn)

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Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Natural gas, one of low-carbon energy sources, has become great concern of the global energy industry. The 27th World Gas Conference (WGC) took place in Washington DC, USA, from 25 to 29 June in 2018, offering a comprehensive and systematic retrospect and prospect concerning the development of world natural gas industry over the past three years. This conference has reached the following common views: natural gas is a kind of low-carbon, clean, green and diversified "reliable, affordable & sustainable" energy source; the world natural gas market displays a relatively loose status; LNG is the focus of the current world natural gas development; methane leakage and emission has become one of the public concerns; the flexibility of the natural gas, the carbon storage technologies and carbon pricing regime have been making natural gas become complemented with renewable energy sources; increasing natural gas self-sufficiency is a powerful means to stabilize regional prices and to decide the price fixing right; and to strive for government support and attract public attention and participation. Based upon the information and understandings obtained from this conference, the following suggestions are thus proposed for further development of natural gas industry in China: to make greater efforts to domestic conventional and unconventional natural gas exploration and development; to complement such bottlenecks of key core technologies such as engineering technology; to take into full account both upstream and downstream natural gas business; to prevent and control the methane leakage all through the whole industrial chain; and to formulate policies on natural gas import trade as a whole. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 14

Main heading: Petroleum prospecting

Controlled terms: Commerce - Costs - Energy policy - Gallium - Gas industry - Gas supply - Gases - Liquefied natural gas - Methane - Natural gas - Renewable energy resources

Uncontrolled terms: 27th World Gas Conference - Import trade - Methane leakage - Natural gas price - Self-sufficient - Unconventional natural

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 523 Liquid Fuels - 525.1 Energy Resources and Renewable Energy Issues - 525.6 Energy Policy - 549.3 Nonferrous Metals and Alloys excluding Alkali and Alkaline Earth Metals - 804.1 Organic Compounds - 911 Cost and Value Engineering; Industrial Economics

DOI: 10.3787/j.issn.1000-0976.2018.09.001

Funding Details:

Funding text: [1] International Gas Union. WGC 2018 Day 1 Newspaper [R/ OL] (2018-06-27). <https://www.igu.org/the-case-of-natural-gas/wgc2018-day-1-newspaper>. [2] Skalmerraas O. The pivotal role of natural gas in the future energy supply[C]//27th World Gas Conference, 25-29 June 2018, Washington DC, USA. [3] International Gas Union. 2018 global gas report[R/OL] (2018-06-27). <https://www.igu.org/news/2018-global-gas-report>. [4] International Energy Agency. Gas 2018[R/OL] (2018-06-27). <https://www.iea.org/gas2018/>. [5] International Gas Union. WGC 2018 Day 2 Newspaper[R/OL] (2018-06-28). <https://www.igu.org/the-case-of-natural-gas/wgc2018-day-2-newspaper>. [6] International Gas Union. WGC 2018 Day 3 Newspaper[R/OL] (2018-06-29). <https://www.igu.org/the-case-of-natural-gas/wgc2018-day-3-newspaper>. [7] International Gas Union. WGC 2018 Day 4 Newspaper[R/OL] (2018-06-30). <https://www.igu.org/the-case-of-natural-gas/wgc2018-day-4-newspaper>. [8] International Gas Union. 2018 world LNG report[R/OL] (2018-06-28). <https://www.igu.org/news/2018-world-lng-report>. [9] Matsuzaka K. Shipping Perspective-towards sustainable LNG market growth[C]//27thWorld Gas Conference, 25-29 June 2018, Washington DC, USA. [10] International Gas Union. Wholesale Price Survey - 2018 Edition [R/OL] (2018-06-28). <https://www.igu.org/news/wholesale-price-survey-2018-edition>. [11] Everaard R. How do we regenerate this generation's view of oil and gas? [C]//27thWorld Gas Conference, 25-29 June 2018, Washington DC, USA. [12] ##### , ##### , ##### . ##### ## (2018) [M]. ## : ##### , 2018. National Energy Administration, Development Research Center of the State Council & Ministry of Land and Resources. China Natural Gas Development Report (2018)[M]. Beijing: Petroleum Industry Press, 2018. [13] ### . ##### —##### [J]. ##### # , 2017, 37(1): 1-8. Ma Xinhua. Natural gas and energy revolution: A case study of Sichuan-Chongqing gas province[J]. Natural Gas Industry, 2017, 37(1): 1-8. [14] ### , ## , # ## , ## , ## , ## , # . ##### ##### [J] . ##### , 2018, 38(4): 1-11. Zou Caineng, Zhao Qun, Chen Jianjun, Li Jian, Yang Zhi, Sun Qiping, et al. Natural gas in China: Development trend and strategic forecast[J]. Natural Gas Industry, 2018, 38(4): 1-11.

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

204. Practice of and suggestions on CBM development in China

Accession number: 20185206284677

Title of translation:

Authors: Mu, Fuyuan (1); Wang, Hongyan (1); Wu, Jingtong (2); Sun, Bin (1)

Author affiliation: (1) PetroChina Research Institute of Petroleum Exploration & Development, Langfang; Hebei; 065007, China; (2) Institute of Geology and Mining Engineering, Xinjiang University, Urumqi; Xinjiang; 830046, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

Volume: 38

Issue: 9

Issue date: September 25, 2018

Publication year: 2018

Pages: 55-60

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The coalbed methane (CBM) development experiences of big CBM production countries (e.g. USA and Australia) are obviously unsuitable to be directly applied to China's CBM development. As several middle-high rank CBM resources with CBM principal production areas in the Qinshui Basin and along the eastern margin of the Ordos Basin as the representatives are put into scale development, summarizing domestic CBM development practices is of great significance to avoiding development risks and increasing development re-practice level. In this paper, the characteristics of domestic CBM resources were studied, and the progresses and results of development practices were reviewed. Then, suggestions on CBM development were proposed specifically from the aspects of pre-development evaluation, geology & gas reservoir engineering study and engineering technology selection. And the following research results were obtained. First, China's CBM resources are characterized by abundant resource, multiple types, poor reservoir conditions, low yield per well, and long production ramp-up period. Second, the guarantee of the successful development is to pay attention to the pre-development evaluation, the preparation of development programs and readjustment programs, the innovation of development theories and technologies, and the process management of engineering construction. Third, the basis for the CBM successful development is to set up reasonable content and rhythm of pre-development evaluation, which shall be treated differently according to specific geological conditions. Fourth, the core to prepare a rational CBM development scheme is reservoir evaluation, dynamic tracing and evaluation, well pattern and well type selection, and multi-layer commingled production selection. Fifth,

the development of engineering technologies shall focus on reservoir protection and stimulation, production control technology and low-cost strategy. It is concluded that the prerequisite and key to successful CBM development is to carry out pre-development evaluation, geological & gas reservoir engineering study and engineering & technology innovation as well. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 25

Main heading: Petroleum reservoir evaluation

Controlled terms: Coal bed methane - Coal deposits - Cost engineering - Engineering technology - Firedamp - Gas engineering - Geology - Methane - Petroleum reservoirs - Production control

Uncontrolled terms: Cbm reservoirs - China - Development effect - Development practices - Development suggestion - Geological study - Pre-development

Classification code: 481.1 Geology - 503 Mines and Mining, Coal - 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 804.1 Organic Compounds - 911 Cost and Value Engineering; Industrial Economics - 913.2 Production Control

DOI: 10.3787/j.issn.1000-0976.2018.09.007

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

205. Quantitative evaluation on the gas production potential of coal reservoirs based on isothermal adsorption curves: A case study of the Changgang Field, northern Guizhou, China

Accession number: 20185206284675

Title of translation: —

Authors: Qin, Yong (1, 2); Zheng, Changdong (1, 2); Wang, Boyang (1, 2); Sun, Changhua (3, 4); Zhang, Minjian (1, 2); Xue, Shuaikang (1, 2)

Author affiliation: (1) School of Resources and Geosciences, China University of Mining and Technology, Xuzhou; Jiangsu; 221116, China; (2) MOE Key Laboratory of Coalbed Methane Resources & Reservoir Formation Process, China University of Mining and Technology, Xuzhou; Jiangsu; 221008, China; (3) Guizhou Natural Gas Energy Investment Co., Ltd., Guiyang; Guizhou; 550081, China; (4) Guizhou Unconventional Gas R&D Center, Guiyang; Guizhou; 550081, China

Corresponding author: Zheng, Changdong(15152102903@163.com)

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 40-47

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: When gas saturation and critical desorption pressure/reservoir pressure ratio are applied to coalbed methane (CBM) area/layer selection, they can hardly reflect the gas production potential of coal reservoirs fully, for CBM desorption capacity and the effect of reservoir pressure on gas desorption in the process of desorption are not considered. In this paper, critical desorption pressure-reservoir pressure difference, critical desorption pressure-abandonment pressure difference, effective desorption quantity and desorption efficiency were extracted based on isothermal adsorption experiment of coal samples. Then, a quantitative evaluation method for evaluating CBM production potential was established. Finally, it was analyzed and verified based on the production history of CBM wells in the Changgang Field, northern Guizhou. And the following research results were obtained. First, the critical desorption pressure-reservoir pressure difference of No.7 coal seam is 2.35 MPa, the critical desorption pressure-abandonment pressure difference under the abandonment pressure of 0.2-1.0 MPa ranges from 2.06 to 2.86 MPa and the CBM effective desorption quantity is between 9.32 and 18.9 m³/t, indicating a favorable gas production potential. Second, the desorption process of CBM in the study area only undergoes the sensitive desorption stage. The coal reservoirs have a higher desorption efficiency and a short adsorption time, so high-yield gas flow is produced shortly after initial gas production. Third, the quantitative CBM potential evaluation and production history of Well FX2 verify that coal reservoirs in this area have the potential of CBM development and production. In conclusion, it is necessary to

slow down the production of CBM wells in the early stage, decrease the pressure decline rate as much as possible and increase the sweeping range of pressure drop funnel and the effective desorption radius. In addition, it is necessary to select the relative high permeability areas and carry out high quality fracturing to enlarge the effective seepage radius and realize the maximum release of CBM productivity. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 22

Main heading: Desorption

Controlled terms: Adsorption - Coal - Coal bed methane - Coal deposits - Efficiency - Firedamp - Flow of gases - Isotherms - Methane - Natural gas wells - Petroleum reservoir evaluation

Uncontrolled terms: Changgang Field - Desorption quantities - Guizhou - Isothermal adsorption - Quantitative evaluation

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 - 631.1.2 Gas Dynamics - 802.3 Chemical Operations - 804.1 Organic Compounds - 913.1 Production Engineering

Numerical data indexing: Pressure 2.00e+05Pa to 1.00e+06Pa, Pressure 2.06e+06Pa to 2.86e+06Pa, Pressure 2.35e+06Pa

DOI: 10.3787/j.issn.1000-0976.2018.09.005

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

206. Necessity and feasibility of using air mixture gas (AMG) as a gas source for China's peak-shaving reserves in China

Accession number: 20185206284688

Title of translation:

Authors: An, Xu (1)

Author affiliation: (1) Jinzhou Beiran Gas Co., Ltd., Jinzhou; Liaoning; 121000, China

Corresponding author: An, Xu(anxu1975@sina.com)

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Volume: 38

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Publication year: 2018

Pages: 139-144

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In recent years, widespread gas supply shortage happens frequently in North China especially in winter heating seasons. The primary energy structure in China is characterized by rich coal, lean oil and less gas, and the coal-to-gas projects have been implemented extensively in recent years. And consequently, such tense situation of gas supply is aggravated. For the sake of increasing the guarantee degree of domestic natural gas supply, the causes of frequent natural gas shortage crisis in recent years and the features of currently common natural gas reserve schemes were analyzed in this paper. Then, it was proposed that the gaseous LNG blended with air, also called air/fuel mixture (AMG for short hereinafter), be used as an important gas source for peak-shaving reserves. In addition, the necessity and feasibility of this scheme was discussed. And the following research results were obtained. First, insufficient gas supply capacity is the bottleneck restricting the sustainable development of domestic natural gas industry, and the practice of abundant LNG imports leads to a crisis of high dependence on foreign natural gas. Second, air mixture gas can be used as a suitable substitute for natural gas and a gas source for peak-shaving reserves. Third, AMG is advantageous with less construction investment, convenient maintenance and strong safety. Besides, no extra gas system is needed, its underground pipeline networks and pressure control facilities can be also used for natural gas to avoid repeated investment, point supply is more convenient and flexible, and real-time startup can be realized. It is concluded that AMG is the practical reserve gas source for natural gas peak shaving, and piped gas consumers shall select rationally compressed natural gas, LNG, AMG or their combinations as the gas source for reserves according to their own characteristics and actual demands. It is recommended that the energy development in the future shall focus on diversification of types and channels and satisfy the reserve demand of local gas peak shaving to the uttermost from

the viewpoint of national energy strategic reserve security, so as to realize the integrated development of multiple gas sources and multiple gas types. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 12

Main heading: Gases

Controlled terms: Compressed natural gas - Gas industry - Gas supply - Investments - Liquefied natural gas - Mixtures - Pipelines - Proven reserves - Sustainable development

Uncontrolled terms: Air mixtures - China - Gas type - Non-homology - Peak shaving - Point supply - Real time

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 523 Liquid Fuels - 619.1 Pipe, Piping and Pipelines

DOI: 10.3787/j.issn.1000-0976.2018.09.018

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

207. A fine control method of flowing pressure in single-phase flow section of high-rank CBM gas development wells: A case study from the Fanzhuang-Zhengzhuang Block in the Qinshui Basin

Accession number: 20185206284680

Title of translation: ---

Authors: Hu, Qiuji (1); Jia, Huimin (1); Qi, Kongjun (1); Fan, Bin (1); Yu, Jiasheng (1); Liu, Chunchun (1); Xie, Linlin (2); Zhang, Qing (1); He, Jun (1)

Author affiliation: (1) CBM Exploration and Development Branch, PetroChina Huabei Oilfield Company, Jincheng; Shanxi; 047000, China; (2) No.3 Oil Production Plant, PetroChina Huabei Oilfield Company, Hejian; Hebei; 062400, China

Corresponding author: Jia, Huimin(jiahuimin1108@sina.com)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 76-81

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: The existing CBM well production control technologies don't take into consideration the effect of the variation of water supply amount of coal seams, so the frequency regulation of pumping unit is less effective and so often to result in the fluctuation of flowing pressure, and consequently reservoirs are damaged. In this paper, No.3 coal seam of Shanxi Fm, Lower Permian in the Fanzhuang-Zhengzhuang Block of the Qinshui Basin, was taken as the study object. After the water production laws of coal seams when a CBM well is in the stage of single-phase flow and the drainage laws of pumping unit system in a CBM well were investigated, a fine control method was determined for bottom hole flowing pressure by theoretically deriving the bottom hole flowing pressure control method based on water production laws of coal seams. Then it was tested on site. And the following research results were obtained. First, when a CBM well is in the stage of single-phase flow, daily water production increases linearly with the decrease of the bottom hole flowing pressure, and the slope is different due to the differences of reservoir physical properties. Second, it is the linear relationship between the theoretical displacement and the actual value of the pumping unit system in the new production wells, and the displacement coefficient is about 0.888. The daily water production of a CBM well in the stage of single-phase flow is proportional to the frequency of pumping unit. Third, the slope and intercept of the frequency-cumulative production time trend line of pumping unit under the reasonable daily pressure decline amplitude are determined by conducting field tests. During the production of gas wells, the actual daily pressure decline amplitude can be guaranteed to be equal to the reasonable value so long as the frequency of pumping unit strictly increases linearly with the increase of cumulative production time according to the reasonable slope. In conclusion, the bottom hole flowing pressure of the CBM wells in the stage of single-phase flow can be controlled precisely by virtue of this method, which plays an active role in promoting the high yield of CBM wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 15

Main heading: Flowing wells

Controlled terms: Bottom hole pressure - Coal - Coal deposits - Flow control - Natural gas well production - Natural gas wells - Production control - Pumping plants - Water supply

Uncontrolled terms: Cbm wells - Control methods - Fanzhuang-Zhengzhuang Block - Flowing pressures - Production increase - Qinshui basin - Rank coal - Single-phase flow - Water production

Classification code: 446 Waterworks - 446.1 Water Supply Systems - 503 Mines and Mining, Coal - 512 Petroleum and Related Deposits - 524 Solid Fuels - 631.1 Fluid Flow, General - 913.2 Production Control

DOI: 10.3787/j.issn.1000-0976.2018.09.010

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

208. Strategic thinking on accelerating the construction of modern natural gas market system in China

Accession number: 20185106260104

Title of translation:

Authors: Jiang, Zi'ang (1); Yang, Zaiyong (2); Zou, Xiaoqin (1); Wang, Zhixiong (2); Yang, Yawen (1)

Author affiliation: (1) Research Institute of Natural Gas Economy, PetroChina Southwest Oil & Gasfield Company, Chengdu; Sichuan; 610051, China; (2) Southwest Branch of PetroChina Natural Gas Marketing Company, Chengdu; Sichuan; 610051, China

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Publication year: 2018

Pages: 120-127

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: To meet the requirements of China's drive to build a modern market system, economic system, and energy system, it is necessary to accelerate the construction of a modern natural gas market system that is unified and open, orderly in competition, complete in system and intelligent in operation and maintenance to guarantee the decisive role of natural gas market in resource allocation. In view of this, in light of experiences and lessons from abroad and based upon the present basic conditions in China, we put forward a framework of a modern natural gas market system, which is composed of resource market of natural gas industrial chain, factor market, market infrastructure, market structure, market mechanism, market regulation and market management. And we also present the following proposals to accelerate the establishment of such a modern natural gas market system: to deepen the reform and guarantee the establishment; to strengthen the infrastructure construction and to promote the market intelligence development; to rationalize the natural gas pricing system and perfect the dynamic price adjustment mechanism; to develop gas-related technology and technology equipment markets; to improve and perfect the natural gas financial market and to avoid market risks; and to complete the relevant codes, laws and regulations in the natural gas sector so as to ensure market rules being open, fair and transparent. In conclusion, this study is of significance to the abundance of energy market theory and the acceleration of establishing a modern natural gas market system to meet with the coming new era of natural gas in China. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 33

Main heading: Commerce

Controlled terms: Construction equipment - Construction industry - Gas industry - Gases - Laws and legislation - Natural gas - Natural gas deposits - Resource allocation

Uncontrolled terms: Construction strategies - Market innovation - Market system - Modern - Reform - System structures

Classification code: 405 Construction Equipment and Methods; Surveying - 405.1 Construction Equipment - 512.2 Natural Gas Deposits - 522 Gas Fuels - 912.2 Management - 971 Social Sciences

DOI: 10.3787/j.issn.1000-0976.2018.10.017

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

209. Large-scale physical simulation experiment of solid fluidization exploitation of marine gas hydrate

Accession number: 20185106260098

Title of translation:

Authors: Zhao, Jinzhou (1); Li, Haitao (1); Zhang, Liehui (1); Sun, Wantong (1); Wu, Kaisong (1); Li, Qingping (2); Zhao, Jun (1); Lü, Xin (2); Wang, Guorong (1)

Author affiliation: (1) State Key Laboratory of Oil & Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu; Sichuan; 610500, China; (2) CNOOC Research Institute Co., Ltd., Beijing; 100027, China

Corresponding author: Li, Haitao(373271769@qq.com)

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Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 76-83

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: Natural gas hydrate is one of the most potential successive energy sources after shale gas, tight gas and coal seam gas. The depressurization method is the main method for the research and trial exploitation of natural gas hydrate at home and abroad, referring to the conventional oil and gas production technologies. Due to its short exploitation time, such previous risks of environmental safety, equipment security, production safety, and engineering geology existed in long-term extraction are avoided. Therefore, the Southwest Petroleum University together with the China National Offshore Oil Corporation (CNOOC) and the Sichuan Honghua Petroleum Equipment Co. LTD advanced the principle of marine gas hydrate solid fluidization exploitation through many years of joint efforts. Based on this principle, a simulation experiment method and technology were developed, and the first large-scale physical simulation experiment system for solid fluidization exploitation of marine natural gas hydrate has been researched and developed. Based on this system, physical simulation experiments of rapid preparation, high-efficient crushing and pipeline transportation in marine non-diagenetic gas hydrate solid fluidization exploitation were carried out; the accuracy of the theoretical model of marine non-diagenetic gas hydrate solid fluidization exploitation was verified; and the variation behavior of key parameters in marine non-diagenetic gas hydrate solid fluidization exploitation was revealed. This study results laid an important foundation for the successful development of the first solid fluidization exploitation of marine natural gas hydrate in the world. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 13

Main heading: Natural gas transportation

Controlled terms: Coal bed methane - Coal deposits - Crushing - Fluidization - Gas hydrates - Gases - Gasoline - Hydration - Natural gas - Offshore oil well production - Pipeline terminals - Pipelines - Safety engineering - Tight gas

Uncontrolled terms: Diagenetics - High efficient - Physical simulation experiment - Pipe-line transportations - Sample preparation

Classification code: 503 Mines and Mining, Coal - 511.1 Oil Field Production Operations - 522 Gas Fuels - 523 Liquid Fuels - 619.1 Pipe, Piping and Pipelines - 802.3 Chemical Operations - 914 Safety Engineering

DOI: 10.3787/j.issn.1000-0976.2018.10.011

Compendex references: YES

Database: Compendex

Compilation and indexing terms, Copyright 2019 Elsevier Inc.

Data Provider: Engineering Village

210. A comparative analysis on the fracture complexity in different fracking patterns of shale gas "well factory"

Accession number: 20191306691384

Title of translation: ""

Authors: Liu, Hong (1); Liao, Rugang (2); Li, Xiaobin (2); Hu, Changquan (2); Xiao, Hui (1); Huang, Yuanyuan (1); Zhang, Xiaoyu (1)

Author affiliation: (1) Chongqing University of Science & Technology, Chongqing; 401331, China; (2) Sinopec Chongqing Fuling Shale Gas Exploration and Development Co., Ltd., Chongqing; 408000, China

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Publication year: 2018

Pages: 70-76

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: This paper aims to optimize the fracking patterns of shale gas "well factory". Considering the condition of multiple wells and fractures, a finite element model of induced stress fields under the effect of multiple fractures was established based on the mathematical model of induced stress under the mutual interference of multiple fractures. Five fracking patterns were simulated, including single-well successive fracking, skip fracking, two-well synchronous fracking, zipper fracking, and modified zipper fracking. The change of induced stress in different horizontal paths and the changing laws of the minimum horizontal principal stress direction were comparatively analyzed. The differences of induced stress fields caused by different fracking orders were mainly discussed. And the following research results were obtained. First, the highest induced compressive stress occurs near the wellbore around the fracture, and the highest induced tensile stress occurs at the fracture tip. Second, as far as the fracking of two horizontal wells is concerned, the induced tensile stress at the fracture tip near the compensating well is greater, and the area between two wells is mainly under the effect of induced tensile stress. Third, the direction of the minimum horizontal principal stress is deflected mainly in the region of fracture tip, and its deflection range and amplitude increase as the amount of fractures increases. Fourth, the induced stress generated in each path by the modified zipper fracking is the highest, and the effect on the induced stress value near the middle of the two wells is especially large, so the modified zipper fracking can increase the complexity of artificial fractures effectively. In conclusion, the research results provide a reference for the prediction of complex fracture networks and the optimization of fracking patterns of shale gas "well factory". © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 19

Main heading: Horizontal wells

Controlled terms: Complex networks - Compressive stress - Fracture - Hydraulic fracturing - Shale gas - Tensile stress

Uncontrolled terms: Artificial fracture - Comparative analysis - Fracture complexity - Fracture network - Induced stress - Maximum horizontal principal stress - Multiple fracture - Mutual interference

Classification code: 512.1.1 Oil Fields - 512.1.2 Petroleum Deposits : Development Operations - 522 Gas Fuels - 722 Computer Systems and Equipment - 951 Materials Science

DOI: 10.3787/j.issn.1000-0976.2018.12.008

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

211. Application evaluation of the PIPE ROCK twist drill string system

Accession number: 20191006600872

Title of translation: PIPE ROCK

Authors: Han, Liexiang (1, 2); Zhang, Jichuan (1, 2); Liu, Wei (1, 2)

Author affiliation: (1) Drilling & Production Technology Research Institute of CNPC Chuangqing Drilling Engineering Co., Ltd., Guanghan; Sichuan; 618300, China; (2) National Energy Shale Gas Research and Development Center, Guanghan; Sichuan; 618300, China

Source title: Natural Gas Industry

Abbreviated source title: Natur. Gas Ind.

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Publication year: 2018

Pages: 73-78

Language: Chinese

ISSN: 10000976

CODEN: TIGOE3

Document type: Journal article (JA)

Publisher: Natural Gas Industry Journal Agency

Abstract: In foreign countries, the twist drill string systems with the Slider system of the Schlumberger Corp. as the representative present good performance during conventional sliding directional drilling, and they can reduce frictional resistance and conquer drilling back pressure. In China, however, such twist drill string systems are still in the stage of test and improvement. In this paper, the independently developed PIPE ROCK twist drill string system was analyzed from the aspects of principle, component, operation process, operation method and experimental result. Then, its technical effectiveness was compared with that of conventional sliding drilling method, and its on-site test results were summarized. Finally, its defects were analyzed and corresponding improvement measures were put forward. And the following research results were obtained. First, the data before and after its application in Well L204 shows that this twist drill string system is remarkable in back pressure prevention. Second, directional track adjustment is totally carried out in the horizontal section of Well Long016-H1 by 20 times. The average net drilling time efficiency of conventional sliding directional drilling system is 64.3% and that of twist drill string system is up to 83.4%, indicating a remarkable improvement of net directional drilling time efficiency. Third, when the torsion pendulum system is adopted, its orienting tool face can be regulated in the process of drilling, so that the tool face can be kept stable for a long time, and orienting accuracy can be improved. Fourth, the twist drill string system shall be improved continuously to develop the intelligent twist drill string system with the function of intelligent track control, for it is currently less automatic, its set value of torque must be regulated artificially in real time, and its application effect is more affected by different operators. In conclusion, the PIPE ROCK twist drill string system can satisfy the requirements of on-site operation, for it successfully solves the back pressure problem in directional drilling, improves net directional drilling time efficiency and orienting accuracy, reduces orienting frequency, shortens the length of direction section and increases the directional rate of penetration and single-trip drilling velocity. Therefore, it is capable of being applied industrially. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 21

Main heading: Drill strings

Controlled terms: Directional drilling - Drilling machines (machine tools) - Drills - Efficiency - Friction - Horizontal wells - Infill drilling - Pendulums - Rock drilling - Rocks - Shale gas

Uncontrolled terms: Drilling time - Drilling velocities - Frictional resistance - Horizontal section - Improvement measure - Operation process - Rate of penetration - Twist drills

Classification code: 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 512.1.1 Oil Fields - 522 Gas Fuels - 603.1 Machine Tools, General - 603.2 Machine Tool Accessories - 913.1 Production Engineering

Numerical data indexing: Percentage 6.43e+01%, Percentage 8.34e+01%

DOI: 10.3787/j.issn.1000-0976.2018.11.009

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Data Provider: Engineering Village

212. How to practice energy metering and pricing of natural gas in China

Accession number: 20185106260105

Title of translation:

Authors: Wang, Fuping (1, 2); Zhou, Juan (2); Duan, Xiaolang (3); Yu, Zhibo (2); Chen, Jiamin (4); Hu, Aolin (2)

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ISSN: 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: China is one of the few countries applying volume metering and pricing of natural gas, but under the present situation of diversified natural gas supply sources, rising demand in gas market, deepening reform on gas system and pricing, and the emerging market competition pattern, to practice energy metering and pricing of natural gas has been in urgent need than ever before. In view of this, we first discussed how and why it is in urgent need in China, then analyzed the encountering problems from the aspects of metering interfaces, metering methodologies, metering units, gas price transformation, pipeline transportation prices, and so on, and finally presented solutions and implementation routes as follows. (1) In this new period of diversified and internationalized supplying sources, deepening structural reform, and the marketization of natural gas pricing and transaction, the traditional volume metering and pricing should be changed into energy metering and pricing of natural gas. (2) Energy metering and pricing should be based upon the corresponding codes system and combine with practices in the natural gas industrial chain, and practical and feasible energy metering interfaces and methodologies should be optimized. (3) Joule should be taken as the energy metering unit and the calorific value of natural gas designated by the National Development and Reform Committee should be calculated from the previous volume pricing to the energy pricing. (4) Energy metering and pricing should be unified in natural gas pipeline transportation prices. (5) Energy metering and pricing should be, based upon pilot projects in advance, gradually pushed forward first to direct supply industrial users, then to non-residential users, and finally to residential users. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17**Main heading:** Natural gas transportation**Controlled terms:** Commerce - Competition - Costs - Gas supply - Gases - Housing - Natural gas - Natural gas pipelines - Phase interfaces - Pipeline terminals - Transportation routes**Uncontrolled terms:** China - Energy metering - Energy pricing - Gas price - Implementation path - Pipe-line transportations**Classification code:** 403.1 Urban Planning and Development - 522 Gas Fuels - 801.4 Physical Chemistry - 911 Cost and Value Engineering; Industrial Economics - 911.2 Industrial Economics**DOI:** 10.3787/j.issn.1000-0976.2018.10.018**Compendex references:** YES**Database:** Compendex

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213. Mechanical mechanisms of tubing string failures in well completion operation: A case study from one HTHP well in the Tarim Basin

Accession number: 20184706088038**Title of translation:** -**Authors:** Yang, Xiangtong (1); Shen, Xinpu (2, 3); Wang, Kelin (1); Shen, Guoyang (2, 3); Geng, Hailong (1); Deng, Peng (1)**Author affiliation:** (1) PetroChina Tarim Oil Company, Korla; Xinjiang; 841000, China; (2) Tianjin Chenxing Engineering and Technology LLC, Tianjin; 301500, China; (3) Guoyang Technology and Services LLC, Houston; TX; 77064, United States**Corresponding author:** Shen, Xinpu(xinpushen@yahoo.com)**Source title:** Natural Gas Industry**Abbreviated source title:** Natur. Gas Ind.**Volume:** 38**Issue:** 7**Issue date:** July 25, 2018**Publication year:** 2018**Pages:** 86-92**Language:** Chinese**ISSN:** 10000976**CODEN:** TIGOE3**Document type:** Journal article (JA)**Publisher:** Natural Gas Industry Journal Agency

Abstract: There is one HTHP well (high temperature, high pressure) in the Tarim Basin about 7 000 m deep with formation temperature 180 and formation pressure of 120 MPa. In the process of its completion operation, the root of thread at the factory end was broken at two points. Therefore, it is necessary to discuss the reasons for the breaking

from the aspects of string deformation and stress change and propose the corresponding measures so as to ensure string integrity and production safety. In this paper, 3D mechanics of strings was analyzed using finite element method. Then, a 3D finite element string mechanics model was established to simulate the string deformation in 3 working conditions (i.e., packer setting, fracturing and testing) in the process of well completion and analyze the displacement of string system and the change laws of stress. Finally, the calculation formula of fatigue safety factor was derived based on the theoretical calculation formula of fatigue strength. And the following research results were obtained. First, the fatigue safety factor of bending stress positions is obtained based on the finite-element numerical calculation results of axial stress at different positions of completion string in this well. Second, the fatigue safety factor of each tubing section during the testing is higher than 3, so it is in the state of safety. Third, the fatigue safety factor of two broken tubing sections is 1.99 and 1.11, respectively, so they are marked as red-warning zones. The fatigue safety factor of other sections is higher than 1.99, so they are classified as safety zones. In conclusion, this method provides an effective analysis means for the string mechanics design of similar ultra-deep HTHP wells. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 8

Main heading: Safety factor

Controlled terms: Buckling - Deformation - Failure (mechanical) - Fatigue of materials - Finite element method - Hydraulic fracturing - Mechanisms - Safety testing - Stresses - Thermal expansion - Thermal fatigue - Tubing - Well completion - Well testing

Uncontrolled terms: 3-D finite elements - Completion operations - Corresponding measures - Deformation and stress - Formation temperature - Numerical calculation - Tarim Basin - Theoretical calculations

Classification code: 512.1.2 Petroleum Deposits : Development Operations - 601.3 Mechanisms - 619.1 Pipe, Piping and Pipelines - 914.1 Accidents and Accident Prevention - 921.6 Numerical Methods - 951 Materials Science

Numerical data indexing: Pressure 1.20e+08Pa, Size 7.00e+03m

DOI: 10.3787/j.issn.1000-0976.2018.07.012

Compendex references: YES

Database: Compendex

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214. Analysis on the weight-on-bit transmission efficiency of the static push-the-bit rotary steerable system

Accession number: 20191006600874

Title of translation:

Authors: Shi, Yucai (1); Teng, Zhixiang (1); Bai, Jing (2); Guan, Zhichuan (1); Liu, Qingcheng (3); Wang, Heng (1)

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Abstract: Now, the static push-the-bit rotary steerable system (SRSS) developed in China is being put into field tests and primary applications. During its normal drilling, higher frictional forces generated by the static pushing forces of the rotary ribs on the wellbore wall influence the weight-on-bit (WOB) transmission efficiency and the rate of penetration (ROP). In this paper, analytical models of the WOB transmission efficiency were established for the wellbore wall with and without ladders respectively based on the structure and working principle of the SRSS. And the variation rules of the WOB transmission efficiency with the nominal WOB, the frictional coefficient of wellbore wall, the pushing force and the front chamfer of the steerable rib were analyzed. And the following research results were obtained. First, the nominal WOB of this SRSS has to satisfy the minimum requirement and it is conducive to the increase of WOB transmission efficiency by increasing the nominal WOB appropriately. Second, whether there are ladders on the

wellbore wall or not, the WOB transmission efficiency decreases as the total pushing forces of steerable ribs and the frictional coefficient of wellbore wall increase. And the WOB transmission efficiency in the case of wellbore wall with ladders is much lower than that without ladders. Third, if there are ladders on the wellbore wall, the front chamfer of steerable rib has a significant effect on the WOB transmission efficiency. The larger the front chamfer is, the lower the WOB transmission efficiency is (even self-locking). In conclusion, the research results play an important role in guiding the rational selection and control of the WOB at drilling site. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 17

Main heading: Efficiency

Controlled terms: Boreholes - Friction - Infill drilling - Ladders - Locks (fasteners) - Oil field equipment - Rotating machinery - Site selection - Tugboats

Uncontrolled terms: Pushing forces - Rotary steerable systems - Selflocking - Transmission efficiency - Weight on bits - Wellbore

Classification code: 405.1 Construction Equipment - 511.1 Oil Field Production Operations - 511.2 Oil Field Equipment - 601.1 Mechanical Devices - 674.1 Small Marine Craft - 913.1 Production Engineering

DOI: 10.3787/j.issn.1000-0976.2018.11.011

Compendex references: YES

Database: Compendex

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Data Provider: Engineering Village

215. Macro-micro occurrence mechanism of organic matters in Wufeng-Longmaxi shale in the Sichuan Basin and its peripheral areas

Accession number: 20185006230369

Title of translation: -

Authors: Wu, Jing (1); Hu, Zongquan (2, 3); Xie, Jun (1); Liu, Zhongbao (2, 3); Zhao, Jianhua (4)

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Abstract: The Macro-micro occurrence characteristics of organic matters in shale are significant to determine their genesis, space-time distribution and hydrocarbon generation mechanism. At present, however, the heterogeneity and model of occurrence between different mineral/lithofacies and organic matters are rarely researched. In this paper, the shale of Upper Ordovician Wufeng Fm-Lower Silurian Longmaxi Fm in the Sichuan Basin and its peripheral areas was studied. The genesis and form of inorganic minerals in micrometer-nanometer scale and their contact relationships with organic matters were systematically analyzed by using X-ray diffraction, core observation, scanning electron microscopy (SEM) and so on. Then, on the basis of lithofacies division, the occurrence relationship between lithofacies and organic matters in centimeter-millimeter scale was studied and the genesis, macro-micro distribution and main control factors of organic matters were discussed. And the following research results were obtained. First, the mineral compositions of shale in the study area are mainly quartz and clay minerals and the organic matters are divided into soluble organic matter and insoluble organic matter. Second, there are three types of organic matter occurrence patterns in quartz, clay minerals and carbonate minerals, and four types in pyrite. Third, the shale in the study area can be divided into four typical lithofacies, including organic-rich siliceous shale, high total organic siliceous clayey shale, high total organic limy siliceous shale and organic-lean silty-clayey shale. Fourth, the occurrence of organic matters in the different scales is heterogeneous. The heterogeneity of organic-rich siliceous shale is presented in the laminae formed in the same or similar sedimentary environment. The heterogeneity of organic-lean silty-clayey shale is presented between the laminae formed under different sedimentary environments. Fifth, the main factors controlling

the occurrence of organic matters include organic matter types and evolution conditions, genesis and morphology of inorganic components, sedimentary environment, etc. In conclusion, the heterogeneous occurrence of organic matters in different scales influences the coincidence of shale gas "sweet spots" distribution and prediction. © 2018, Natural Gas Industry Journal Agency. All right reserved.

Number of references: 41

Main heading: Organic minerals

Controlled terms: Biogeochemistry - Biological materials - Clay minerals - Pyrites - Quartz - Scanning electron microscopy - Sedimentology - Shale

Uncontrolled terms: Heterogeneity - Late Ordovician - Lithofacies - Macroscopic and microscopic - Sichuan Basin - Silurian

Classification code: 461.2 Biological Materials and Tissue Engineering - 481.1 Geology - 481.2 Geochemistry - 482.2 Minerals

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Compendex references: YES

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