

CHINA COALBED METHANE

(Bimonthly)

Vol.21 No.1 February.2024

1

2024

主管单位：国家矿山安全监察局

主办单位：煤炭信息研究院

中联煤层气有限责任公司

编辑出版：《中国煤层气》编辑部

主 编：张 勇

副 主 编：朱光辉 刘文革 李忠城

印 刷：北京华联印刷有限公司

定 价：18 元

发 行：《中国煤层气》编辑部

(100029 北京市朝阳区

芍药居 35 号)

国际标准连续出版物号：ISSN 1672-3074

国内统一连续出版物号：CN 11-5011/TD

广告发布登记：京朝市监广登字 20190010 号

电 话：(010) 84657948 (投稿)

(010) 84657905 (征订)

传 真：(010) 84657941

http: //www. iiem. ac. cn

Email: cbmc@ iiem. ac. cn

中国煤层气

ZHONGGUO MEICENGQI

2004 年创刊 (双月刊)

第 21 卷第 1 期 2024 年 2 月

编辑委员会

名誉主任：王显政

主 任：桂来保

副 主 任：张 勇 黄盛初 戴照辉

委 员：(按姓氏笔画排列)

于志军 马 耕 王 刚 王 荣 王思鹏

王保玉 王俊立 韦 波 牛志刚 申瑞臣

史治国 汤达祯 孙粉锦 李云峰 李 伟

李来新 李国君 李明辉 杨陆武 闵 龙

宋 岩 张正喜 张建奇 张晓宏 张遂安

张 群 郑柏平 胡千庭 胡予红 胡顺鹏

胡爱梅 柳迎红 侯泉林 姚 超 秦 勇

徐开杰 曹国庆 龚 敏 梁爱堂 琚宜文

韩 颖 游 浩 蔡文渊

秘 书 长：韩甲业

Editor Committee

Honorable Chairman: Wang Xianzheng

Chairman: Gui Laibao

Vice Chairman: Zhang Yong Huang Shengchu
Dai Zhaohui

Commissioners:

Yu Zhijun, Ma Geng, Wang Gang, Wang Rong, Wang Sipeng, Wang Baoyu, Wang Junli, Wei Bo, Niu Zhigang, Sheng Ruichen, Shi Zhiguo, Tang Dazhen, Sun Fenjin, Li Yunfeng, Li Wei, Li Laixin, Li Guojun, Li Minghui, Yang Luwu, Min Long, Song Yan, Zhang Zhengxi, Zhang Jianqi, Zhang Xiaohong, Zhang Suian, Zhang Qun, Zheng Baiping, Hu Qianting, Hu Yuhong, Hu Shunpeng, Hu Aimei, Liu Yinghong, Hou Quanlin, Yao Chao, Qin Yong, Xu Kaijie, Cao Guoqing, Gong Min, Liang Aitang, Ju Yiwen, Han Ying, You Hao, Cai Wenyan

Secretary-general: Han Jiaye

目次

2024年第1期

新疆煤层气勘查开发现状及存在的问题与对策建议	来鹏 杨曙光 杜世涛 (3)
沁水盆地煤层气水平井缝网体积压裂工艺优化研究	王静 王青川 张永琪 姚伟 张金笑 (8)
煤层气开发L型井水平井排采工程的研究	陶占盛 吉耘君 许超 (12)
煤层气井排采设备适应性分析	朱建英 高丽军 高正龙 王辉 张学敏 段宝江 (17)
煤层气筛管水平井低产原因分析和治理对策研究——以沁水盆地南部煤层气筛管水平井为例	王琪 张聪 贾慧敏 何珊 刘春春 (21)
高阶煤层气水平井合理稳产点研究——以沁水盆地南部郑庄区块为例	雷兴龙 毛崇昊 樊彬 崔新瑞 王岩 (25)
泵送桥塞射孔联作工艺在新疆淮南煤田煤层气开发中的应用	王壁鸿 唐助云 李中博 刘子强 王慧 (29)
干法脱硫工艺在煤层气田的应用——以沁水盆地潘河区块为例	何思琦 张森 (33)
煤的温压吸附试验方法与等温吸附试验方法比较研究	马青华 张学梅 梁磊 魏亚玲 李东 郝静远 (37)
致密气藏新投产区块上市储量评估方法研究与应用——以A区块为例	曹珮 徐中波 陈国宁 (43)

Main Contents

Vol. 21 No. 1

Current Situation and Existing Problems of Coalbed Methane Exploration and Development in Xinjiang Countermeasures and Suggestions	LAI Peng <i>et al.</i> (3)
Optimization of Volume Fracturing Network Technology for Coalbed Methane Horizontal Wells in Qinshui Basin	WANG Jing <i>et al.</i> (8)
Research on Drainage and Production Engineering of L-shaped Horizontal Wells for Coalbed Methane Development	TAO Zhansheng <i>et al.</i> (12)
Adaptability Analysis of Coalbed Methane Well Drainage and Production Equipment	ZHU Jianying <i>et al.</i> (17)
Study on Causes and Treatment Methods of Low Production of Coalbed Methane Screen Horizontal Well —A Case Study in Southern Qinshui Basin	WANG Qi <i>et al.</i> (21)
Research on Rational Stable Production Point of High-rank Coalbed Methane Horizontal Wells —A Case Study of Zhengzhuang Block in Southern Qinshui Basin	LEI Xinglong <i>et al.</i> (25)
Application of Pumping Bridge Plug Perforation Combined Process in Coalbed Methane Development in Zhunnan Coalfield of Xinjiang	WANG Bihong <i>et al.</i> (29)
Application of Dry Desulfurization Process in Coalbed Methane Fields—A Case Study of Panhe Block in Qinshui Basin	HE Siqi <i>et al.</i> (33)
Comparative Study on Temperature Pressure Adsorption Test Method and Isothermal Adsorption Test Method for Coal	MA Qinghua <i>et al.</i> (37)
Research and Application of SEC Reserves Evaluation Method for New Production Block of Tight Gas Reservoir—A Case Study of Block A	CAO Pei <i>et al.</i> (43)

新疆煤层气勘查开发现状及存在的问题与对策建议

来鹏¹ 杨曙光¹ 杜世涛²

(1. 新疆维吾尔自治区煤田地质局煤层气研究开发中心, 新疆 830091;
2. 新疆维吾尔自治区煤田地质局一六一煤田地质勘探队, 新疆 830046)

摘要: 文章通过对新疆煤层气勘查开发工作的梳理, 确立了准噶尔盆地南缘和塔里木盆地北缘为新疆煤层气的重点勘查开发区域; 依托准噶尔盆地南缘初步形成了一套适应新疆的地质理论体系; 增强了工程与地质的适应性, 针对新疆多厚煤层优化多种井型组合及低伤害低摩阻高效储层改造技术。但同时也面临新的挑战与问题, 针对这些问题, 提出了一些对策建议, 比如设立专项资金, 加大勘查投入, 建立工作机制与长效沟通, 协调解决煤层气矿权与煤炭、石油天然气的重叠问题, 研究制定支持政策和补贴。

关键词: 新疆煤层气 开发 对策与建议

Current Situation and Existing Problems of Coalbed Methane Exploration and Development in Xinjiang Countermeasures and Suggestions

LAI Peng¹, YANG Shuguang¹, DU Shitao²

(1. Coalbed Methane R&D Center, Xinjiang Coal Geological Bureau, Xinjiang 830091;
2. No. 161 Coal Exploration Team, Xinjiang Coal Geological Bureau, Xinjiang 830046)

Abstract: Through the review of the coalbed methane exploration and development work in Xinjiang, the following achievements have been made: the southern margin of Junggar Basin and the northern margin of Tarim Basin have been established as the key exploration and development areas of coalbed methane in Xinjiang; based on the southern margin of Junggar Basin, a set of geological theory system adapted to Xinjiang has been formed; it enhances the adaptability of engineering and geology, and optimizes a variety of well combinations and low-damage, low-friction and efficient reservoir reconstruction technology for multi-thick coal seams in Xinjiang. However, at the same time, new challenges and problems have emerged, In response to these issues, countermeasures and suggestions are proposed, such as establishing special funds, increasing exploration investment, establishing a working mechanism and maintaining effective communication, coordinating to resolve the overlap of coalbed methane mining rights with coal and oil and gas, researching and formulating supportive policies and subsidies.

Keywords: Coalbed methane in Xinjiang; development; countermeasures and suggestions

沁水盆地煤层气水平井缝网体积 压裂工艺优化研究

王静 王青川 张永琪 姚伟 张金笑

(中国石油华北油田山西煤层气勘探开发分公司, 山西 046000)

摘要: 从煤层气的解吸机理开展剖析, 明确气井的增产是要构建立体的人工缝网, 以增加更多的裂缝参与流动。为此首先分析实现人工缝网所需的压裂液体系, 认为低粘度压裂液是形成大面积缝网的首要因素; 其次, 从施工排量、成本控制、安全风险等多方面综合考虑, 选取主体压裂工艺为桥射联作; 再次就所选压裂工艺进行不断优化, 根据现场实际情况设计出沁水盆地南部压裂所使用的施工参数。通过现场试验应用结果表明, 该工艺能够满足构建体积缝网的需要, 达到了增产的目的, 为沁水盆地南部高阶煤层气井的压裂增产提供了新思路, 为高效开发煤层气提供了新方法。

关键词: 煤层气 压裂 桥射联作 改造

Optimization of Volume Fracturing Network Technology for Coalbed Methane Horizontal Wells in Qinshui Basin

WANG Jing, WANG Qingchuan, ZHANG Yongqi, YAO Wei, ZHANG Jinxiao
(PetroChina Huabei Oilfield Company, Shanxi 046000)

Abstract: By analyzing the desorption mechanism of coalbed methane, the paper clarifies that the stimulation of gas wells requires the construction of a three-dimensional artificial fracture network to increase the participation of more fractures in the flow. Firstly, the fracturing fluid system required to achieve artificial fracture networks is analyzed, and it is considered that low-viscosity fracturing fluid is the primary factor in forming large-area fracture networks. Secondly, taking into account various factors such as construction displacement, cost control, and safety risks, the main fracturing process of bridge plug perforation combined operation is selected. Thirdly, the selected fracturing process is continuously optimized, and the construction parameters used in fracturing in the southern part of the Qinshui Basin are designed based on the actual situation on site. The on-site test application results show that this process can meet the needs of building a volume fracture network and achieve the goal of increasing production. It provides a new idea for fracturing and increasing production of high-rank coalbed methane wells in the southern Qinshui Basin, and offers a new method for efficient development of coalbed methane.

Keywords: Coalbed methane; fracturing; bridge plug perforation combined operation; renovation

煤层气开发L型井水平井排采工程的研究

陶占盛 吉耘君 许超

(山西兰花煤层气有限公司, 山西 048000)

摘要: 研究L型水平井的举升系统选型以及排采生产制度的设计, 形成举升系统选型的方法, 建立排采生产制度的设计模型; 以在排采的L型水平井生产工程、煤粉形态为依据, 总结L型井各排采举升系统的优劣势; 从排采过程管控的重点与难点进行分析, 研究L型水平井排采生产制度的动态设计, 建立“区块生产制度”, 单井“差异化生产制度”实现区块产能目标最大化。

关键词: 排采举升系统 产能模拟 拟合预测 单位流压降幅产水量 应力与渗透率平衡

Research on Drainage and Production Engineering of L-shaped Horizontal Wells for Coalbed Methane Development

TAO Zhansheng, JI Yunjun, XU Chao

(Shanxi Lanhua Coalbed Methane Co., Ltd, Shanxi 048026)

Abstract: This study investigates the selection of lifting systems for L-shaped horizontal wells and the design of drainage and production systems. It forms a method for selecting lifting systems and establishes a design model for production systems. Based on the production engineering and coal powder morphology of the L-shaped horizontal wells, it summarizes the advantages and disadvantages of various lifting systems for the L-shaped wells. Through the analysis of the key and difficult points in the process control during drainage and production, it studies the dynamic design of the production system for L-shaped horizontal wells, and establishes “a block production system” to maximize block production capacity by implementing a “differentiated production system” for individual wells.

Keywords: Adaptation of mining lifting system technology; three forms of coal powder; capacity simulation; fit prediction; water production per unit flow pressure reduction; balance between stress and permeability.

煤层气开发进入L型井高速发展的阶段, L型井主要完井方式包含钢筛管完井、玻璃钢筛管完井、固井压裂完井、无固井压裂完井。不同地质条件、选择不同的完井工艺。

地质条件、完井工艺的叠加, 给L型井的排采工程技术提出高挑战。在排采过程中本身产水量呈现“低—高—低”的过程, 地质与工程影响到产水量峰值, 受井眼轨迹的限制, 既需要维持连

煤层气井排采设备适应性分析

朱建英 高丽军 高正龙 王 辉 张学敏 段宝江

(中海油能源发展股份有限公司工程技术分公司, 天津 300450)

摘要: 排采设备的选择是否合理是保障煤层气井连续、稳定、合理排采的前提条件。煤层气井井型种类多, 部分井轨迹复杂, 采用的主要排采设备有杆式抽油泵、管式抽油泵、顶驱螺杆泵、电潜螺杆泵、水力同心型无杆泵等多种。根据不同排采设备不同的排采原理, 以及它们的优缺点和适用条件, 对它们在潘庄区块不同条件的煤层气井的应用情况, 从检泵周期、检泵原因以及防偏磨、防煤粉、能否满足沉没度要求等多角度进行了适应性分析, 总结出了考虑地面、井筒、储层、费用等多因素条件下各排采设备对煤层气井的适用条件, 为潘庄区块及类似煤层气井排采设备的优选提供了重要的参考价值。

关键词: 煤层气 排采设备 顶驱螺杆泵 电潜螺杆泵 水力同心型无杆泵 适应性分析

Adaptability Analysis of Coalbed Methane Well Drainage and Production Equipment

ZHU Jianying, GAO Lijun, GAO Zhenglong, WANG Hui, ZHANG Xuemin, DUAN Baojiang
(CNOOC EnerTech-Drilling & Production Co., Tianjin 300450)

Abstract: The reasonable selection of drainage equipment is a prerequisite for ensuring continuous, stable, and reasonable drainage and production of coalbed methane wells. The main drainage equipment used in coalbed methane wells include rod pump, tubular pump, top drive screw pump, electric submersible screw pump, hydraulic concentric rodless pump, and other types. Elaborated on the different principles of drainage equipment, as well as their advantages, disadvantages, and applicable conditions. And the application of different drainage equipment in different conditions of coalbed methane wells in Panzhuang Block was analyzed. Adaptability analysis was conducted from multiple perspectives such as pump inspection cycle, pump inspection reasons, and prevention of eccentric wear, coal powder, and whether it can meet the requirements of submergence depth. The applicability conditions of various drainage equipment for coalbed methane wells were summarized considering multiple factors such as ground conditions, wellbore conditions, reservoir conditions, and cost. This provides important reference value for the optimization of drainage equipment in Panzhuang Block and similar coalbed methane wells.

Keywords: Coalbed methane; drainage equipment; top drive screw pump; electric submersible screw pump; hydraulic concentric rodless pump; adaptability analysis

煤层气筛管水平井低产原因分析和 治理对策研究

——以沁水盆地南部煤层气筛管水平井为例

王琪 张聪 贾慧敏 何珊 刘春春

(华北油田山西煤层气勘探开发分公司, 山西 046000)

摘要: 筛管水平井是煤层气开发过程中较为重要的一种井型, 在渗透率高的浅层煤层气开发中取得产量突破。但随着储层地质条件变差、气井生产时间延长, 实际生产实践中出现部分低产筛管水平井。本文从地质因素、钻井因素、排采因素、作业因素四个角度对煤层气筛管水平井低产原因进行了讨论。煤储层渗透率低、地层堵塞、井筒堵塞是造成筛管水平井低产的三大原因。针对不同低产原因形成了针对性措施增产改造工艺。各措施增产工艺技术在沁水盆地南部樊庄区块取得较好效果。

关键词: 筛管水平井 低产原因 治理措施 工艺技术

Study on Causes and Treatment Methods of Low Production of Coalbed Methane Screen Horizontal Well —A Case Study in Southern Qinshui Basin

WANG Qi, ZHANG Cong, JIA Huimin, HE Shan, LIU Chunchun

(Shanxi Coalbed Methane Exploration and Development Branch, PetroChina Huabei
Oilfield Company, Shanxi 04600)

Abstract: The screen horizontal well is a kind of important well type in coalbed methane exploitation, achieving breakthroughs in production in the development of shallow coalbed methane with high permeability. However, with the deterioration of reservoir geological conditions and the prolongation of gas well production time, some low-production screen horizontal wells have appeared in production practice. This paper discusses the causes of low production of coalbed methane screen horizontal wells from four factors: geological factor, drilling factor, production factor and operation factor. Low permeability of coal reservoir, coal reservoir plugging and wellbore plugging are the three main reasons causing the low production in screen horizontal wells. The corresponding measures to increase production are developed for different reasons of low production. The techniques for increasing production have been well applied in Fanzhuang Block in the southern Qinshui Basin.

Keywords: Screen horizontal well; causes of low production; measures of treatment; process technology

高阶煤层气水平井合理稳产点研究

——以沁水盆地南部郑庄区块为例

雷兴龙 毛崇昊 樊彬 崔新瑞 王岩

(中石油华北油田山西煤层气勘探开发分公司, 山西 046000)

摘要: 文章从 Langmuir 等温吸附方程出发, 准确划分排采解吸阶段。随着煤储层压力的降低, 解吸效率呈现出基本不变、缓慢增大、快速增大到急速增大。解吸效率从基本不变到缓慢增大的节点为启动压力, 从快速增大到急速增大的节点为敏感压力。对郑庄区块水平井生产资料分析发现, 敏感压力与产气达峰值时间存在正相关关系, 最后以解吸阶段为主, 稳产压力与敏感压力比值为辅, 验证了在快速解吸阶段达稳产煤层气井产气效果较好, 而且稳敏比越高, 产气效果越好。

关键词: 排采解吸阶段 煤层气井 敏感压力 排采制度 现场应用

Research on Rational Stable Production Point of High-rank Coalbed Methane Horizontal Wells —A Case Study of Zhengzhuang Block in Southern Qinshui Basin

LEI Xinglong, MAO Chonghao, FAN Bin, CUI Xinrui, WANG Yan

(Shanxi Coalbed Methane Exploration and Development Branch, PetroChina

HuaBei Oilfield Company, Shanxi 046000)

Abstract: Based on the Langmuir isothermal adsorption equation, this paper accurately divides the stages of desorption during production. With the decrease of coal reservoir pressure, the desorption efficiency transitions from basically unchanged to slowly increasing, then rapidly increasing, and finally sharply increasing. The point at which the desorption efficiency transitions from basically unchanged to slowly increasing is referred to as the starting pressure, and the point from rapidly increasing to sharply increasing is termed the sensitivity pressure. The analysis of production data from horizontal wells in Zhengzhuang Block shows that the sensitive pressure is positively correlated with the time to reach the peak gas production time. Finally, with the desorption stage as the main criterion, and the ratio of stable production pressure to sensitive pressure as the secondary one, it is verified that it will achieve better gas production effects when the coalbed methane wells enter stable production during the rapid desorption stage. Moreover, a higher stable sensitivity ratio indicates a better gas production effect.

Keywords: Stages of desorption during production; coalbed methane wells; sensitivity pressure; extraction system; field application

泵送桥塞射孔联作工艺在新疆淮南煤田 煤层气开发中的应用

王壁鸿 唐助云 李中博 刘子强 王 慧

(新疆维吾尔自治区煤田地质局一五六煤田地质勘探队, 新疆 830009)

摘要: 随着新疆煤层气井开发的行业发展, 煤层气从钻井到排采各个施工工艺都在转变, 常规压裂工艺在煤层气井压裂施工中已出现技术限制。泵送桥塞射孔联作工艺具有施工排量大、压裂级数不受限制、施工周期短的优点, 在煤层气井体积压裂方面开始广泛应用。采用射孔与桥塞带压联作工艺, 通过压裂泵车将工具串送入预定位置坐封, 桥塞先行坐封, 然后射孔, 能够提高施工的效率 and 压裂改造效果。本文将对此技术采用的主要设备、工艺流程、工艺特点、工艺优化及在新疆淮南煤层气开发现场的实际应用情况作出阐述。

关键词: 泵送桥塞 射孔联作 光套管压裂

Application of Pumping Bridge Plug Perforation Combined Process in Coalbed Methane Development in Zhunnan Coalfield of Xinjiang

WANG Bihong, TANG Zhuyun, LI Zhongbo, LIU Ziqiang, WANG Hui

(No. 156 Coalfield Geological Exploration Team, Coalfield Geological Bureau of
Xinjiang Uygur Autonomous Region, Xinjiang 830009)

Abstract: With the development of the coalbed methane well development industry in Xinjiang, various construction techniques for coalbed methane from drilling to drainage are changing. Conventional fracturing techniques have encountered technical limitations in coalbed methane well fracturing construction. The pumping bridge plug perforation combined process has advantages such as large construction displacement, unrestricted fracturing stages, and short construction period, and has been widely used in the volume fracturing of coalbed methane wells. By using the combined process of perforation and bridge plug with pressure, the tools are sent to the predetermined position for sealing by a fracturing pump truck. The bridge plug is first sealed, and then perforation is carried out, which can improve the efficiency of construction and the effect of fracturing transformation. This article will elaborate on the main equipment, process flow, process characteristics, process optimization, and practical application of this technology in the development of coalbed methane in Zhunnan of Xinjiang.

Keywords: Pumping bridge plug; perforation combination; light casing fracturing

干法脱硫工艺在煤层气田的应用

——以沁水盆地潘河区块为例

何思琦^{1,2} 张森²

(1. 中联煤层气(山西)有限责任公司, 山西 048000; 2. 三气共采省技术创新中心, 山西 030008)

摘要: 本文以沁水盆地潘河区块15号煤产出气中硫化氢的脱除工艺为例, 结合煤层气田的集输工艺和生产情况, 阐述了如何进行脱硫工艺选择、脱硫药剂选择、安装位置选择、工艺设计, 并对煤层气区块的伴生硫化氢处理提出合理建议。

关键词: 硫化氢 干法脱硫 脱硫工艺 填料塔

Application of Dry Desulfurization Process in Coalbed Methane Fields —A Case Study of Panhe Block in Qinshui Basin

HE Siqi^{1,2}, ZHANG Sen²

(1. China United Coalbed Methane Co., Ltd., Shanxi 048000;

2. Three gas extraction provincial technology innovation center, Shanxi 030008)

Abstract: This article takes the removal process of hydrogen sulfide from the produced gas of the No. 15 Coal Seam in Panhe Block of Qinshui Basin as an example. Combined with the gathering and production conditions of coalbed methane fields, it explains how to choose the desulfurization process, select desulfurization agents, choose installation locations, and design the process. Reasonable suggestions are also proposed for the treatment of associated hydrogen sulfide in the coalbed methane blocks.

Keywords: Hydrogen sulfid; dry desulfurization; desulfurization process; packed tower

煤层气是以吸附态贮存在煤层中, 主要组分为甲烷的可燃性气体, 俗称瓦斯, 长久以来被认为是一种清洁能源, 其开发利用不但可以有效解决煤炭开采中的瓦斯灾害问题, 也符合国家当前低碳转型发展趋势。沁水盆地潘河煤层气区块自2005年开始开发, 优先开采3号煤, 建成了国家级煤层气开发利用示范工程, 区块采取单井、阀组、集气站的集输工艺, 即单井通过采气管线将煤层气送至阀组, 再通过阀组集输管线送至下一个阀组, 最终汇

集至总集输站进行商品化处理。随着各煤层气区块的不断开发, 不同煤层中的煤层气先后被开采, 不同煤层中解吸的煤层气, 其组分也出现了多样性, 如沁水盆地潘河区块山西组3号煤煤层气的甲烷含量98%以上, 二氧化碳和氮气含量在1%以内, 同区本溪组15号煤煤层气组分与3号煤煤层气类似, 但出现了伴生硫化氢, 个别井硫化氢含量超过 $100\text{mg}/\text{m}^3$ (20°C , 101.325kPa), 众所周知, 硫化氢是有毒、有害的气体, 人若吸入会有生命危险,

煤的温压吸附试验方法与等温 吸附试验方法比较研究

马青华¹ 张学梅¹ 梁磊¹ 魏亚玲² 李东¹ 郝静远^{1,3}

(1. 西安思源学院能源及化工大数据应用教学研究中心, 陕西 710038;
2. 新疆三如盛业测试技术有限公司, 新疆 830000; 3. 西安交通大学化工学院, 陕西 710049)

摘要: 为了研究煤的温压吸附试验方法在煤层气吸附方面的可行性, 本文对煤的温压吸附试验方法与煤的高压等温吸附试验方法进行了比较研究。分别取12个、10个、8个、和6个温压吸附试验点作为四组不同温度和相应不同压力作为温压吸附试验点, 记为 $V_{\text{实测}}$ 。使用温度-压力-吸附方程 (Temperature-Pressure-Absorption Equation (TPAE)), 将方程转化为二元一次方程后进行线性回归计算其余三个参数, 将所得的四个参数记为 $V_{\text{计算}}$ 。通过计算 $V_{\text{实测}}$ 与 $V_{\text{计算}}$ 之间的平均相对误差和标准偏差以衡量温压吸附试验方法的可行性。

关键词: 煤层气 低温梯度 煤的温压吸附试验 煤的高压等温吸附试验 误差计算

Comparative Study on Temperature Pressure Adsorption Test Method and Isothermal Adsorption Test Method for Coal

MA Qinghua¹, ZHANG Xuemei¹, LIANG Lei¹, WEI Yaling², LI Dong¹, HAO Jingyuan^{1,3}

(1. Energy & Chemical Engineering Research Center, Xi'an Siyuan University, Shaanxi 710038;
2. Xinjiang Sanrushengye Testing Technology Co., Ltd., Xinjiang 830000;
3. College of Chemical Engineering, Xi'an Jiaotong University, Shaanxi 710038)

Abstract: In order to study the feasibility of the temperature and pressure adsorption test method of coal in the adsorption of coalbed methane, this paper compares the temperature and pressure adsorption test method of coal with the high-pressure isothermal adsorption test method of coal. Take 12, 10, 8, 6 temperature and pressure adsorption test points as four sets of different temperatures and corresponding pressures as the temperature and pressure adsorption test points, denoted as V_{measured} . Use the Temperature Pressure Absorption Equation (TPAE) and convert the equation into a binary linear equation, then perform linear regression to calculate the remaining three parameters. Calculate the adsorption capacity of the four parameters obtained, denoted as $V_{\text{calculated}}$. The feasibility of the temperature pressure adsorption test method is evaluated by calculating the average relative error and standard deviation between V_{measured} and $V_{\text{calculated}}$.

Keywords: Coalbed methane; low-temperature gradient; temperature pressure adsorption test for coal; high-pressure isothermal adsorption test for coal; error calculation

致密气藏新投产区块上市储量 评估方法研究与应用 ——以A区块为例

曹珮 徐中波 陈国宁

(中海石油(中国)有限公司, 北京 100010)

摘要: 上市储量是油气公司的重要资产, 而对于新投产区块, 资产价值评估也较为重要。A区块是我国重要的致密气产区, 在投产初期, 在产井较少, 上市储量评估存在较大难度。本文基于A区块及其邻区B区块地质特征、储层特征相近、可类比的前提, 采用动态类比法, 评估投产初期A区块上市储量。A区块在产井单井技术可采储量为 $850 \times 10^4 \text{m}^3$, 总体单井技术可采储量 $700 \times 10^4 \text{m}^3$, 与实际生产情况较为吻合。该方法将指导未来中海油新投产致密气区块上市储量评估, 并对行业带来一定思考。

关键词: 致密气 上市储量 动态类比法 初产 递减率

Research and Application of SEC Reserves Evaluation Method for New Production Block of Tight Gas Reservoir —A Case Study of Block A

CAO Pei, XU Zhongbo, CHEN Guoning

(CNOOC (China) Co., Ltd., Beijing 100010)

Abstract: SEC reserves are important assets for oil and gas companies, and the assessment of asset value is also important for new production blocks. Block A is an important tight gas-producing area in China. In the initial production stage, there are few producing wells, making it difficult to assess the technically recoverable reserves. Based on the premise that the geological characteristics and reservoir characteristics of Block A and its adjacent Block B are similar and comparable, this paper adopts the dynamic analogy method to evaluate the SEC reserves of Block A in the initial stage of production. The technical recoverable reserves of the production wells in Block A are $850 \times 10^4 \text{m}^3$ per well, with a total technical recoverable reserves of $700 \times 10^4 \text{m}^3$ per well, which is consistent with the actual production situation. This method will guide the evaluation of SEC reserves of CNOOC's new production tight gas blocks in the future, and provide insights for the industry.

Keywords: Tight gas; SEC reserves; dynamic analogy method; initial production; decline rate