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低渗薄层碳酸盐岩气藏水平井长度优化研究

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A study on Horizontal Well Length Optimization in Low Permeability and Thin Layer Carbonate Reservoir

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PDF (PC)

214

摘要/Abstract

摘要 :

水平段长度直接影响水平井的控制储量、单井产量和钻井成本等指标,是决定水平井开发效果的关键因素。针对靖边气田碳酸盐岩气藏的低渗、薄层、强非均质特点,在水电模拟实验研究气井渗流机理的基础上,综合数值模拟分析、经济评价和现场应用效果优化水平段长度。研究表明:水平井泄气面积近似椭圆,水平段跟端和趾端为主要渗流单元。当水平段长度大于1 000m时水平井稳产5年配产可以达到直井的3倍以上|当水平段长度为3 000m时,经济效益最优|综合考虑产量目标、效益目标和实钻效果确定马五₁₊₂气藏水平井合理水平段长度为1 000~1 500m。该研究成果已经用于靖边气田产能建设中,也可为其他类似气田水平井设计提供借鉴。

关键词: 靖边气田, 碳酸盐岩, 低渗气藏, 水平井, 渗流机理, 长度优化

Abstract:

The length of the horizontal section of a horizontal well has a direct effect on controlled reserves, single well output, drilling cost and other indicators. It is a key factor to determine the development performance. For carbonate reservoir with low permeability, thin layer and strong heterogeneity in the Jingbian Gas Field, based on the hydro-electrical analogy on gas percolation mechanism, to optimize the length of horizontal section, a comprehensive analysis has been carried out, including numerical simulation, economic evaluation and field application. The evaluation results show that a horizontal well gas drainage area is approximately elliptic, the major percolation parts are on the heel end and toe end. When the horizontal length is greater than 1000m, after 5-year plateau the production allocation can reach three times more than a vertical well|when the length is 3 000m, the economic benefit is optimal|for the targets of output and efficiency, as well as drilling result, it was determined that the reasonable horizontal length of well Ma5₁₊₂ is 1 000m to 1 500m. The research results have been applied in the production capacity construction of Jingbian Gas Field, and it provides a reference for other similar horizontal gas wells design.

Key words: Jingbian Gas Field, Carbonate, Low permeability reservoir, Horizontal well, Percolation mechanism, Length optimization

中图分类号:

TE37

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