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非均质气藏可动水评价及提高采收率新思路

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Assessment of the Movable Water in Heterogeneous Gas Reservoir and New Thoughts of Enhancing Gas Recovery

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摘要/Abstract

摘要 :

气藏衰竭式开采过程中,因高含水停喷甚至大面积水淹造成气井关井是很难治理的问题,准确评价气藏可动水对于高含水气藏治理及提高采收率有重要意义。以塔里木盆地塔河非均质底水气藏为例,测试了不同物性储层、不同驱替压差条件下的岩心含水饱和度、可动水饱和度和束缚水饱和度,结合渗透率、孔隙度等主要影响因素进行对比分析,研究发现同一岩心的可动水饱和度和含水饱和度随驱替压差的变化趋势一致,而且岩心的渗透率越大,相同驱替压差下可动水饱和度和含水饱和度越高;在含水饱和度和可动水饱和度较高时,两者随驱替压差增加而快速下降,而在含水饱和度和可动水饱和度较低时,两者随驱替压差增加下降缓慢;气藏不同区块的岩心含水饱和度和可动水饱和度随驱替压差变化的范围不同。在可动水评价基础上,结合精细地质建模及数值模拟技术,根据气藏剩余气及含水饱和度分布状态,设计了综合部署“采气井、阻水井、排水井”的治理增产方案,通过加强井网控制程度、封堵优势渗流通道、排泄地层水体能量进而提高气藏采收率。

□

关键词: 气藏, 可动水, 驱替压差, 非均质性, 综合治理, 提高采收率

Abstract:

For the gas reservoir utilizing exhausting way to develop,it is a serious problem that wells stop production or shut down because of water flooding,so it is important to evaluate the movable water of high water content gas reservoir for managing and enhancing gas recovery.The study takes the heterogeneous gas reservoir with bottom water in Tarim Basin as an example,and then tests the cores' water saturation and movable water saturation and irreducible water saturation,and takes comparative analysis with permeability and porosity.Finally,we find that movable water saturation and water saturation have the same trends in the same core under different flooding pressure,and they are bigger in cores with higher permeability.They decrease rapidly with the increase of flooding pressure when they are at high value,and they decrease slowly with the increase of flooding pressure when they are at low value.Their variation range differentiates in different block with different characteristics.Based on the assessment of movable water and the distribution of residual gas and water,this study puts forward the new thought of enhancing gas recovery by utilizing fine geological model and numerical simulation,through reinforcing well net controlling degree and sealing advantaged seepage channel and decreasing the water energy,designs the improvement project with gas wells,obstacle wells and drainage wells.

Key words: Gas reservoir, Movable water, Displacement pressure difference, Heterogeneity, Comprehensive treatment, Enhance gas recovery

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