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Water-out Characteristics and Remaining Oil Distribution Pattern of Different Types of Channel Sands in Lasaxing Oilfield

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Abstract

As to the problems of coexistence of intrastratal remaining oil and inefficient/invalid circulation of injecting water; the hardness of identifying and exploiting the remaining oil, through the comprehensive analysis of 101 core wells and well testing data on the basis of recognition of channel sand interlayer, this paper researched the waterflooded conditions and dynamic behavior of remaining oil in the three kinds of typical thick channel sandstone reservoir. Meanwhile, the study shows that 10% in thickness of the channel sandstone reservoir is in the status of inefficient/invalid circulation of injecting water at the period of extra-high water-cut. The ideal geological model was constructed and the effects of heterogeneity on remaining oil distribution and development result are analyzed by using of numerical simulation, and the heterogeneity elements include permeability rhythm in the layer, horizontal interlayer, lateral accretion interlayer and etc. The potential tapping measures, such as fine WSO(water shut off), subdivided water inject, alteration of waterflood direction and improvement of injecting-production system, were proposed in this paper and the field application has achieved good result of reducing water-cut and increasing production.

Keywords: extra-high water-cut; inter-architecture; inefficient/invalid circulation; remaining oil; tapping measures

Being developed for 40 years with water flooding and adjustments, the Lasaxing Oilfield has entered the extra-high water-cut period comprehensively. Study shows that there is still 70% of the remaining geological reserve remains in thick reservoir, which is more than 1m in net thickness. But the distribution of remaining oil in these reservoirs is rather complex, and there are other problems, such as coexistence of intrastratal remaining oil and inefficient/invalid circulation of injecting water, so it is very hard to identify and exploit of the remaining oil. A lot of work has been done in the study of remaining oil description and inefficient/invalid reservoir identification^[1-8], and some conclusion was proposed, but there is still in a shortage of effective method. In order to improve the development result of Lasaxing Oilfield in extra-high water-cut and tap the remaining oil thoroughly, a constructive exploration on remaining oil description, inefficient/invalid circulation identification and management, intrastratal remaining oil tapping is made, and the field application shows a good effect.

1. Characteristics of remaining oil distribution in thick reservoir

Based on the recognition of inter-architecture, knowledge about the 101 core wells and 759 channel sand core samples and combining with numerical simulation method, the dynamic behavior of remaining oil of three kinds of typical channel sandstone (which are braided river, meandering river and underwater distributary channel) in thick reservoir is studied in this paper. And the effects of interlayer, permeability rhythm and injection/production relationship on remaining oil distribution are analyzed.

Analysis of watered out characteristic in thick reservoir

The percentage of watered out reservoir thickness in braided river and meandering river sandstone is 20% higher than that in underwater distributary channel at the period of medium-high water cut, while the percentage of watered out reservoir thickness in meandering river and underwater distributary channel sand is similar, which is about 70%, is 20% lower than that in braided river sandstone.