Cause analysis of low production and low efficiency Wells and treatment countermeasures

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Abstract. After years of exploitation of oilfields, the development of oilfields is becoming more and more difficult, and the number of low-yield and low-efficiency oil wells is gradually increasing, which has become a major problem in the development, which not only affects the recovery rate, but also increases the production cost.

Key words: Low yield and low efficiency, cause, Treatment countermeasure

1. Introduction

With the deepening of oilfield development, the proportion of low-yield and low-efficiency Wells increases year by year, which increases the rate of water-drive production decline and water-cut rise, and restricts the overall development effect and benefit of oilfield. It is necessary to analyze and investigate the current situation of low production and low efficiency, determine the treatment countermeasures, fully tap the potential of oil reservoir, improve the utilization rate of oil and water Wells, and then achieve the purpose of improving the development effect of oil field and improving the development efficiency of oil field, which is of great significance to create and manage oil reservoirs and realize the sustainable development of water drive.

2. Low production and low efficiency well definition

low production and low efficiency well refers to a certain period of time, the cumulative production of a single well is very low, from the perspective of economic benefits, refers to the recent stage of production has no economic benefits or low economic benefits of the well.

3. Cause analysis of low production and low efficiency Wells

(1) The exploitation objects of some Wells are the thin and off-sheet oil reservoirs, which have poor development, low permeability, poor connectivity, low controlled reserves, and low production and low efficiency Wells.
(2) Due to the influence of fault shading, narrow river channels, casing damage and other factors, the injection and production of the well group is imperfect, the energy replenishment is not timely, and the well pattern control degree is low, resulting in low-production and low-efficiency wells. Blocked by faults, the water injection direction is single, and the communication is not good, resulting in the imperfect injection-production relationship of the single layer, resulting in low-yield and low-efficiency wells. After the casing loss of the water injection well, from the perspective of casing damage control, it is necessary to control the water injection or stop the injection of the well, and wait for the overhaul to resume normal water injection, and the deterioration of the liquid supply of the oil well will also produce low production and low efficiency.

(3) Due to the serious heterogeneity of the reservoir, the contradictions between or within the reservoir are prominent, and low efficiency Wells are formed. The different water absorption conditions of each layer of the well easily lead to the injection water outburst along the high permeability layer, which makes the corresponding oil well water cut rise faster. By analyzing the geometric form of sand body development and distribution, it is concluded that the more complex the sand body shape is, the more serious the plane heterogeneity, the greater the water drive resistance, the greater the difference in seepage characteristics between oil and water Wells, the worse the efficiency of oil Wells, and the easy to form low production and low efficiency.
(4)The oil reservoir is seriously polluted, resulting in low production and low efficiency. Due to the pollution caused by injection water quality, drilling, perforation and operation construction, the oil reservoir is blocked by impurities, resulting in low production and low efficiency Wells.

4. Processing of seismic data

The research area focuses on the G4 oil layer as the research target layer. Based on seismic data, well data, and other information, a seismic work area is established. Seismic frequency extension technology is applied to broaden the main frequency of seismic data, making the seismic waveform clearer and the details more abundant, improving the overall seismic resolution, and achieving a higher recognition rate for thin sand layers. Perform a 90 ° phase rotation of 3D seismic data to correspond the logging curve with the seismic reflection interface, preparing for the production of isochronous stratigraphic slices. From the comparison before and after processing, it can be seen that the seismic reflection is more pronounced after processing(Fig. 1).

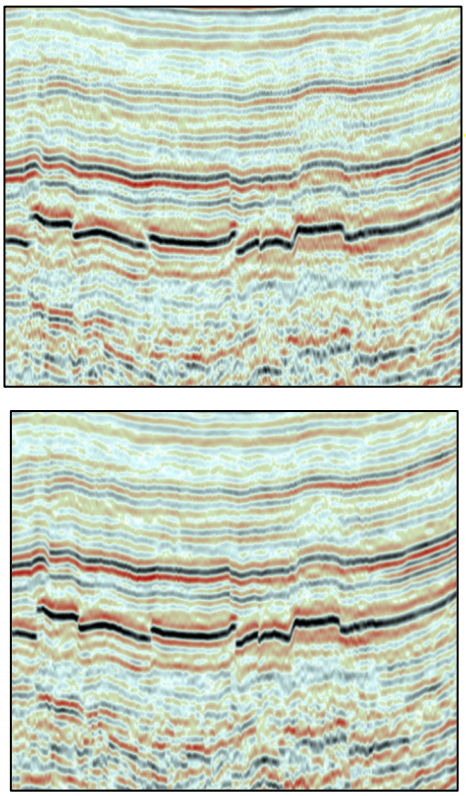

Fig. 1 Changes in seismic reflection characteristics before and after frequency expansion processing of G4 oil layer

5. Sequence stratigraphic framework

After the establishment of the seismic work area, the sequence stratigraphy is divided under the guidance of the sequence stratigraphy theory, in combination with seismic well data, logging data, drilling core data and other data. The top and bottom of the target layer G4 oil reservoir group are identified in the seismic work area, and the G4 oil reservoir group is further divided into three medium-term cycles, namely, G4 upper, G4 middle, and G4 lower, and a total of 18 short-term cycles[7], G41-G418(Fig. 2). By combining well and seismic data, an isochronous stratigraphic framework is established for the entire area. Standard wells with multiple layers, relative concentration, obvious cycles, and vertical separability are selected, and the study area is compared with other typical wells for cycles. The G4 oil layer group is divided into three sets of sand formations and 18 small layers, with G4 corresponding to G4 top to G46, G4 corresponding to G47 to G413, and G4 corresponding to G414 to G4 bottom.

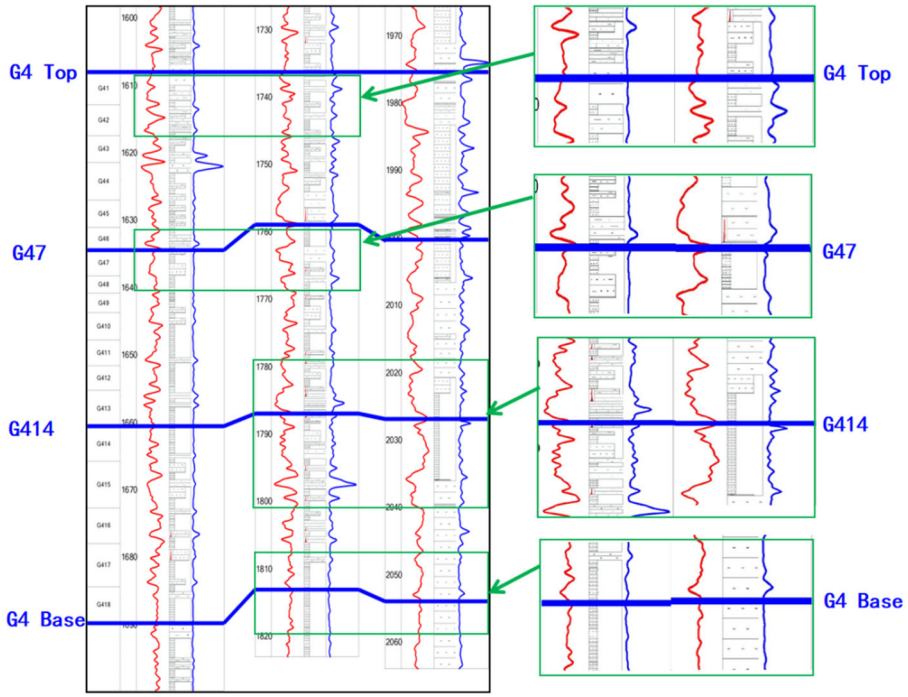

Fig. 2 Stratigraphic framework of G4 oil layer in Area A

6. Treatment measures of low production and low efficiency Wells

(1) For the Wells with poor reservoir development, the treatment measures are based on the principle of comprehensive utilization of well pattern, and the main measures are borehole repair, well subdivision and well fracturing, which can effectively improve the connectivity of oil and water Wells and increase the exploitation degree of poor reservoir.
(2) For the Wells with imperfect injection-production, the treatment measures are to improve the injection-production relationship by means of oil well reinjection, drilling supplementary Wells, ultra-short radius horizontal drilling, overrepair of casing damage Wells, etc.
(3) For the serious heterogeneity of oil reservoir, the treatment measures are based on the combination of plugged-supplement, plugged-pressure and plane adjustment to improve the injection and production structure.
(4) For the serious pollution of the oil reservoir, the single well with low liquid production, low water cut grade, perfect injection and production, no less than two inflow directions, and good spacing required by the fracturing technology level shall be treated by fracturing measures.

7. Conclusion

When the oilfield is developed to a certain stage, low-yield and low-efficiency wells will inevitably appear, and the treatment of low-yield and low-efficiency wells is a long-term process. By analyzing and classifying low-yield and low-efficiency wells, different treatment countermeasures are adopted to improve the production and efficiency of oil wells.

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