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Oil-Water Distribution Law and Controlling Factors of Putaohua Reservoir in The X1 Block of Puxi Oilfield

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Abstract: According to the test of oil exploration, the production of oil wells, indoor tests and logging data, oil-water distribution law can be studied. The results show that the oil and water have the zoning feature in the plane, for specific performance, the oiliness of the east is high, the oiliness of the center is poorer, and the oiliness of the west is good. Beside, the oil and water have the characteristic of differentiation in vertical, and the layers which full of oil are from P Ⅰ 6 to P Ⅰ 8.The main controlling factor of the distraction of oil and water includes: faults and structural location decide the plane characteristic of oil and water. In the background of facies of delta front, underwater distributary channel sandbody is the high-quality reservoir of Putaohua reservoir. NNW direction faults and underwater distributary channel is the best matching for controlling oil.

Keywords: Puxi oilfield; Putaohua reservoir; oil-water distribution law ; controlling factors.

INTRODUCTION

Geographical location in the study area is located in Zhaoyuan country and Duerbote monggol nationality autonomous county in the Daqing city of Heilongjiang province. Tectonic position is located in the Puxi nose-like structure of the central depression area, southern Qijia-Gulong depression in Songliao basin.The purpose of the study Putaohua Reservoir belongs to Yao group sedimentary formation with large lake delta front deposition [1, 2].

DISTRIBUTION LAW

Plane distribution law

According to oil exploration, the data of production performance of oil well, the plane figure of distribution of oil-water of Putaohua reservoir of X block in Puxi oilfield can be drawn (Fig.1). From the figure, we can know that the study area is cut by two large faults, which is divided into three part, the three sides are eastern part、central part and western part respectively. And the oiliness of the east is high, the oiliness of the center is poorer, the oiliness of the west is good. Due to the different parts have different accumulation factors, the enrichment of oil and water and the distribution regularity is different from the west slope to eastern slope [3, 4].

The vertical distribution law

According to the contrast of layers and electric logging data interpretation, through the main tectonic position, vertical profile of reservoir about oil-water of Putaohua reservoir in study area .From the fig. 2, the main ample oil layers are P Ⅰ 6-P Ⅰ 8. A single structural trap from bottom to top conform to the distribution characteristic that oil is up and water is in bottom of oil and water, while the distribution characteristic of oil and water is not obvious on the whole. Partial area show different characteristic that oil is bottom and water is up, where the connectivity of sandbody is poor.The oiliness of P Ⅰ 1-P Ⅰ 5 and P Ⅰ 9-P Ⅰ 11 is reduced, which related to the tectonic location and sedimentary system.The oil-water distribution characteristic is normal in eastern area, which illustrate development degree of sand body is higher, and the distribution of oil-water is mainly controlled by structural factors.The convert oil-water distribution is obvious in western area, which illustrate the distribution of oil-water is mainly controlled by the development degree of sand body.

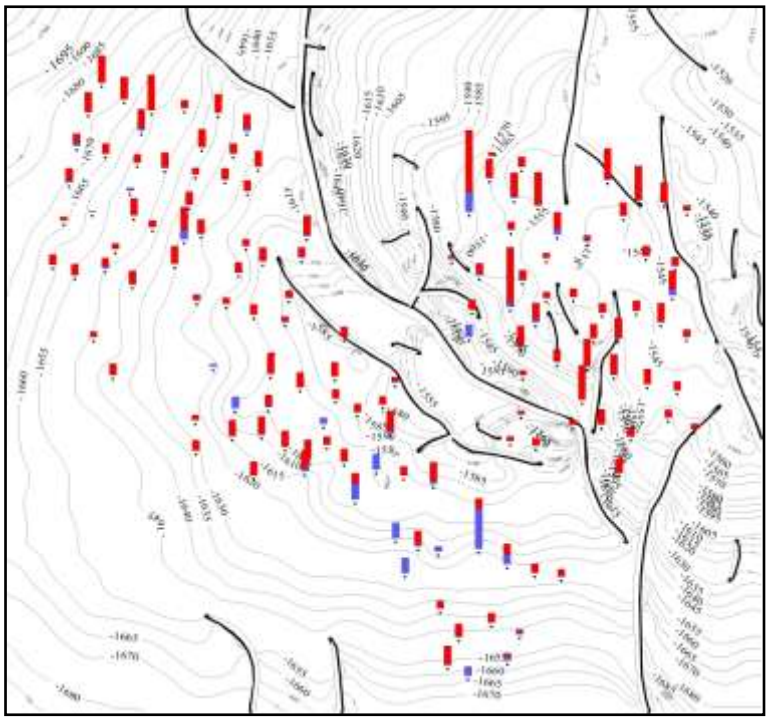

Fig.1: The figure of the oil-water distribution of Putaohua reservoir in Puxi oil field

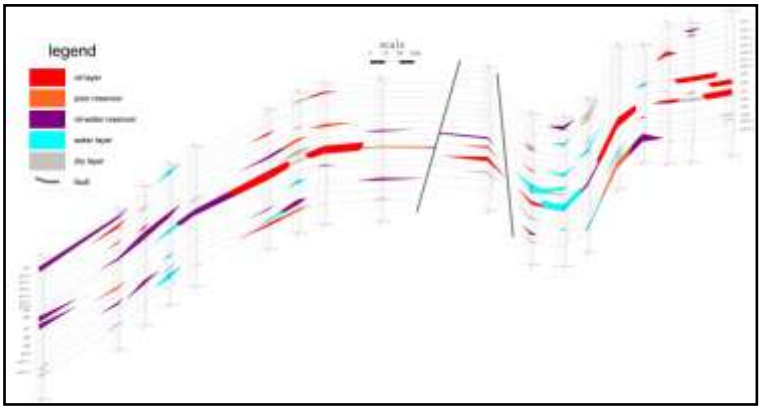

Fig. 2: The vertical profile of reservoir of Putaohua layer in Puxi oil feiled

MAIN CONTROLLING FACTOR

Structural factor

The development of fault control the format of structural unit in study area, control the formation of trap at the same time [5]. Puxi oilfield obviously develop fault for NNW, a small amount for NW. The study area mainly was separated by two large faults, which form three fault blocks. The oil-water interface of every fault block was counted. As a result, the characteristic of oil-water interface of every fault block is different. The oil-water interface of western fault block is lower than eastern fault block. Although different fault block has different oil-water interface, every fault block has its own oil-water interface. Described above, fault has a certain effect on the segmentation of the distribution of oil-water. Different faults separate study area into different part which has different distribution law in vertical.

The sedimentary factors

Putaohua reservoir is in the background of delta front subfacies, which develop the underwater distributary channel and sheet sand microfacies.

Controlled by WN sedimentary system, sand body along the source article in zonal distribution.Sedimentary sandbody has an important effect on oiliness of reserve [6, 7]. Puxi oilfield develop several kinds of sedimentary sand, they are respectively underwater distributary channel , main sheet sand and thin sheet sand.The oiliness of underwater distributary channel is good, main sheet body is poorer than former, thin sheet sand is the poorest which even become the water layer.

The matching of the fault and sand body

The matching of the fault and sand body control the oil-water distribution and enrichment degree.Fault in area has the strike of NNW, a small amount of fault with the strike of SN. The oil-water distribution show banding shape in the study area, different zone has different enrichment degree. The boundary of zone grow fault which extent long, oil-water distribution law of two sides of fault is different mostly, oil along the updip direction of fault migrate [8]. The existence of the fault cut the area of rich oil and rich water, which has closed effect on the losing of oil and gas, which result that fault block oil reservoir and fault-lithological oil reservoir are main kinds of reservoir.The matching of sedimentary sand and fault form trap in Puxi oilfield.The strike of sand body of underwater distributary channel and the strike of fault encounter with large angle. Faults keep out sand body in the updip direction, which become the most favorable accumulation condition.

CONCLUSION

(1) The oil and water have the zoning feature in the plane, for specific performance, the oiliness of the east is high, the oiliness of the center is poorer, the oiliness of the west is good. Beside, the oil and water have the characteristic of differentiation in vertical, and the layers which full of oil are from P I 6 to P I 8. A single structural trap from bottom to top conform to the distribution characteristic that oil is up and water is in bottom .The oil-water relation is complex in the whole.

(2) The main controlling factor of the distraction of oil and water includes: faults and structural location decide the plane characteristic of oil and water. In the background of facies of delta front, underwater distributary channel sandbody is the high-quality reservoir of Putaohua reservoir. NNW direction faults and underwater distributary channel is the best matching for controlling oil.

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