Geological Recognition and Expansion Potential Analysis of the New 172-52 Drilling Area

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Abstract. Fine reservoir characterization is the basis of tapping the potential of high-yield exploration and evaluation wells. In this paper, the comprehensive prediction of New 172-52 reservoir in high-yield exploration and evaluation well area is carried out by using seismic data combined with drilling data, the sand body in the study area is re-depicted, and the geological understanding after drilling is integrated. It is concluded that the effective thickness of the well area on the east side of the fault in this area changes rapidly and gradually becomes thicker to the southeast, and the sand body is developed and has good connectivity, and there is potential for edge expansion above the oil-water interface. In the well area on the west side of the fault, according to the seismic reservoir attribute, the abandoned well after drilling is at the edge of the sand body, and the sand body extends to the northeast around the well point, and meets the fault block at the high part of the structure, which has the potential of expanding the edge. Through fine reservoir characterization, the boundary and scale of sand bodies are explored, and the productivity potential of high-yield exploration and evaluation wells is tapped.

Keywords: Fine reservoir characterization, Combination of well and earthquake, Sand body boundary and scale, Expansion potential.

1. Oilfield overview

The New 172-52 high yield exploration and evaluation well area is located in the south of Xinzhaos oilfield, the slope of Xinzhaos nose structure in Qijia Gulong sag, and the target layer is Putaohua reservoir. There are two test wells xin156-68 and xin172-52 in the block. The oil test results show that the two wells are all self flowing after the target layer test perforation, and the daily oil production is 7.45t and 11.9t respectively. Around the layout of two high-yield wells, 10 wells are planned to be drilled, 12 wells are to be built, and the production capacity is 7600 tons. At present, 7 wells have been drilled, 1 well is abandoned and 3 wells are cancelled. The study area is divided into two new well areas, i.e., the East-West well area and the north-west well area.
2. Geological characteristics and potential analysis of drilling completion in newly built well area 156-68

2.1. Understanding of geology after drilling
Six wells are planned to be drilled in this well area, and six wells have been drilled. According to the drilling completion situation, there are the following three characteristics. First, the effective thickness encountered by drilling is smaller than that predicted by the scheme. The effective thickness of 6 wells after drilling is 0.9-2.8m, which changes rapidly. The effective thickness of New 148- Inclined 64 in the north of the well area is the smallest, and gradually increases to the south. The average effective thickness of a single well is 1.9m, which is predicted by the plan to be 2.7m, with a difference of 0.8m.

| Well area       | Well No          | Effective thickness (m) | Average effective thickness (m) |
|-----------------|------------------|-------------------------|--------------------------------|
| New 156-68      | New 148-Inclined 64 | 0.9                     |                                |
|                 | New 150-Inclined 66 | 1.8                     |                                |
|                 | New 152-Inclined 68 | 2.2                     |                                |
|                 | New 154-Inclined 66 | 1.2                     |                                |
|                 | New 156-Inclined 64 | 2.8                     | 1.9                            |
|                 | New 158-Inclined 66 | 2.5                     |                                |

Second, the main layer is outstanding. It can be seen from the statistical Fig. of drilling rate that the drilling rate of sandstone in Layer 3, Layer 9 and 11-2 is relatively high, in which Layer 3 is the main layer, with the drilling rate of sandstone being 100% and the effective drilling rate being 83.3%. The average thickness of single-layer sandstone is 2m, and the effective thickness is 0.9m, which is mainly thin sheet sand.

Third, the oil-water relationship is simple, with oil layer and dry difference layer as the main layers, and oil-water same layer is developed at the bottom of local structure. A reservoir profile has been drawn from north to south in 6 wells after drilling. It can be seen from the Fig. that the sand body of the No.3 layer of the main layer is developed, the oil layer is stable and has good connectivity.

2.2. Analysis of edge expansion potential
Based on the above analysis, according to the sand body and fluid distribution characteristics, it is considered that there is potential for edge expansion above the oil-water interface in the southeast of New 156-68 well area, and the effective thickness tends to become thicker. It is suggested to expand two wells in the southeast of the well area.

Fig. 1 Reservoir Profile of Putaohua Reservoir in New 156-68 Well Area
3. Geological characteristics and potential analysis of completion drilling in New 172-52 well area

3.1. Geological knowledge of drilling completion
In this well area, 4 wells are planned to be drilled, and 1 well is finished. New 170- inclined 54 is at the high part of the structure. Compared with the high-yield well New 172-52, the target layers 2-1, 4-2 and 9 have not been drilled, and the reservoirs in the whole well are poorly developed and have no effective thickness, so the geology is discarded. In order to reduce the drilling risk, the other three design wells were subsequently cancelled.

3.2. Analysis of edge expansion potential
The logging and oil test data of New 172-52 high-yield well show that the reservoir of this well has good oil-bearing property, with single well sandstone thickness of 11.2m and effective thickness of 7.2m m. Three target layers are tested for oil production, and self-flowing after perforation, with daily oil production of 11.9t t. This sand body has certain potential, but it is difficult to determine the boundary and scale of the sand body.

Comprehensive reservoir prediction is carried out by using seismic data combined with drilling data, and it is considered that the abandoned well after drilling is at the edge of sand body. Sand body extends northeast around this well point, and is blocked by faults at the high part of the structure. It is suggested to expand two wells at the high part. It is necessary to further evaluate the potential drilling risks of the cancelled three design wells. It is suggested to continue to implement one well in the low position to explore the boundary and scale of sand body.

4. Conclusions
(1) The main layer in New 156-68 well area is prominent, the oil-water relationship is simple, and the oil layers are distributed in the main layer. The sand body in New 172-52 well area changes rapidly laterally, and the drilling risk is high.

(2) Combining well with earthquake, 4 wells can be initially expanded in New 172-52 high-yield well block.

(3) High-yield exploration and evaluation wells have low well control degree and high drilling risk. Earthquake tracking and prediction should be strengthened to guide drilling operation.

(4) Potential of the four wells with initial edge expansion, strengthening the combination of well and earthquake, predicting sand bodies and relying on actual well locations.

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