Reservoir Type and Main Controlling Factors of Reservoir Forming in Block T21-7-3 of South Buir Sag

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Abstract

South Buir Sag of Tamsag Basin has good prospects for exploration with complicated petroleum geology background, less pre-information, unclear oil and water distribution, lacking fine reservoir anatomization. To help finding oil and gas, this paper focuses on reservoir subdivision, identification of reservoir type and oil and water distribution of Lower Section of Lower Zuunbayan Formation in Block T21-7-3.

Keywords

South Buir Sag, sand, reservoir type, oil and water distribution.

1. Introduction

South Buir Sag was secondary unit of tectonic in Tamsag Basin. Tamtsag Basin is located in the eastern part of Mongolia, extending north into the territory of China. It and the Hailar Basin in China belong to some tectonic units, collectively referred to as Hailar Tamtsag Basin. The exploration area of South Buir Sag is about 3500 km^2. It contains North frog of east sub-sag, South frog of east sub-sag, East concave Nan wa trough, West with broken nose, central uplift belt, the Southern buried hill covered belt and so on, a total of 13 tertiary tectonic units[1].

The north of 21 blocks is located in the tertiary tectonic unit of North frog of east sub-sag in South Buir Sag, and the south of 21 blocks is located in the tertiary tectonic unit of South frog of east sub-sag in South Buir Sag.

2. Oil reservoir type

The main source rocks formation of Wuerxun sag in Hailaer basin is Nantun group(Fig.1). Damoguaihe group and Tong group also have source rocks. Nantun group is the best source rocks in basin.

From the perspective of oil and gas exploration, the classification of the reservoir is more predictive based on the formation of traps. The traps are different in different structures, stratigraphic and lithologic conditions, the characteristics of the reservoirs are different, and the reservoirs are also different. Through the collection of information and understand, South Buir Sag reservoir contains 4 types such as block oil and gas reservoir, fault lithologic reservoir, lithologic reservoir and stratigraphic unconformity reservoir[2-6]. On the basis of this, the Block T21-7-3 reservoir is studied.

According to the test results of oil and new and old wells interpretation results, combining structure with reservoir research data, we renderred the reservoir profile and carried out the analysis of the distribution of oil and water. The Block T21-7-3 is controlled by reverse fault structural lithologic reservoir (Figure 2). Oil is concentrated in I and II oil group, and the lower part of the reservoir oil group II developed water layer.

SYSTEM AND SERIES			THICKNESS (m)	LITHOLOGY
SYSTEM	GROUP	MEMBER		
quaternary			7.5-69.5	
tertiary	Huchashan		39.5-83	
Upper cretaceous	Qingyuangang		55.5-308	
Lower Cretaceous	Yi min	third	170-320	
		second	200-350	
		first	250-320	
	Da mo guai	second	370-450	
		first	350-400	
	Nan tun	second	300-350	
		First	150-220	
	Tong bo miao		500	
Before cretaceous				

Fig 1 comprehensive stratigraphic column

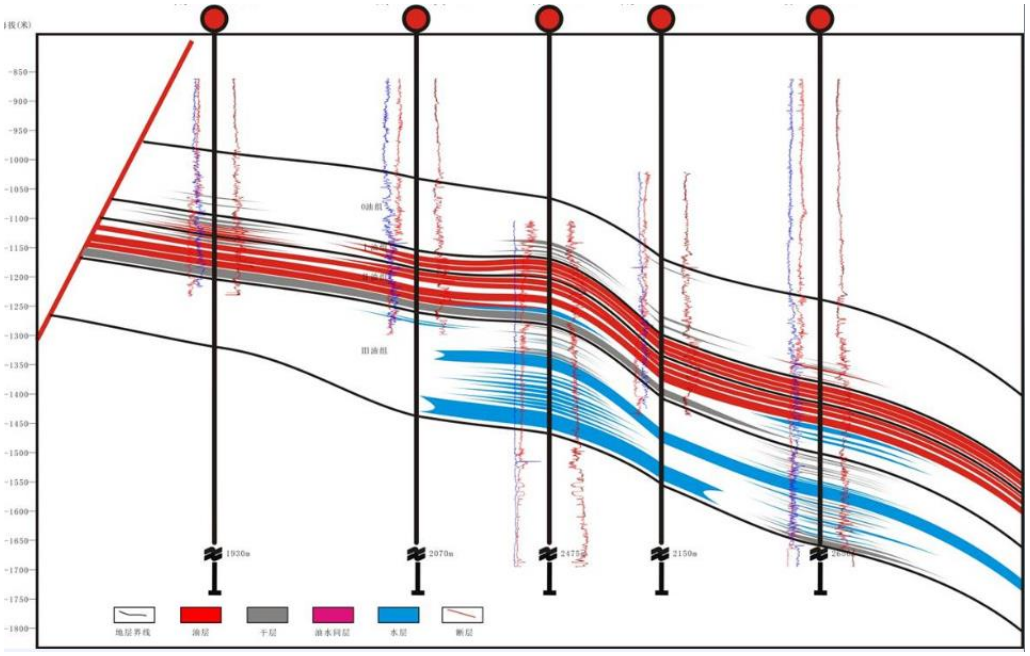

Figure 2 Block T21-7-3 reservoir profile

Based on the well stratified data, well logging interpretation and seismic inversion results, the effective thickness contour map of the 8 small layers of the 2 oil groups in the Block T21-7-3 is drawn. Through the study found that the Block T21-7-3 by the sand body development, reservoir continuity is poor; I oil group, the main small layer NI3, the average thickness of 1.4 meters, II oil group of the main small layer NII1, 2, 8 small layer, the average thickness are 1.1 meters.

3. Oil water distribution law

By logging data, seismic data and oil test data,we found South Beir sag are mainly distributed in the north and south direction. The overall performance is: from south to North oil-bearing shows good to bad to good rules, the district between the blocks have a uniform oil-water interface.

Vertically, the south of the Block T21-7-3 is divided into 4 oil groups, 24 small layers, according to the test data, the results of the comprehensive interpretation and reservoir subdivision data, statistical study of the oil level of each small layer.

According to I oil group of top elevation from high to low order (Figure 3), we can see: (1) With the decrease of the depth of the top elevation of the I oil group, the oil bearing reservoirs gradually become deeper and deeper. (2) The longitudinal displays " water beneath oil" or "oil dry" feature .

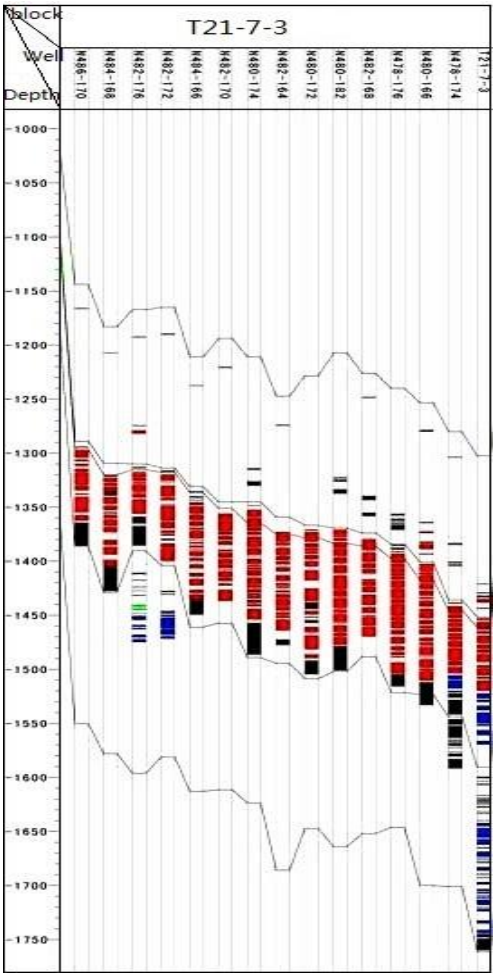

Figure 3 Distribution of oil and water in the south of Block T21-7-3

4. Main controlling factors of reservoir formation

4.1 Hydrocarbon source rock

From the point of view of the region, South Buir Sag contains a lot of dark mudstone. The quality of Nan first group hydrocarbon source rocks is best.①Thin layer thickness is bigger.② High content of

organic matter (TOC>5%).The hydrocarbon source rock is pure and the sandy content is low, and the deep lacustrine and semi deep lacustrine mudstone are widely developed.

4.2 Structure

Structure is important for the development of reservoir, the direction of hydrocarbon migration and accumulation of oil and gas in the formation of the basin. Structure can control the direction of oil and gas migration and accumulation of oil and gas in large scale, and the number of accumulation of oil and gas is controlled by the height of structure. From the figure 2， it can be observed that there is more oil in the high part of the structure in Block T21-7-3 reservoir.

4.3 Sand

We stack Sand ratio contour map and oil well location together. Oil reservoir is mainly distributed in the block which is bigger than the sand. Block T21-7-3 sand ratio is 71%, indicating the reservoir sand body is developed.

4.4 Fault sealing

Fault also has a certain relationship with oil and gas. Fault sealing ability affects the enrichment degree of oil and gas. On the one hand, it causes the oil and gas reservoirs to be destroyed. On the other hand, the fault can prevent oil and gas migration under appropriate conditions. It formed oil and gas reservoirs of fault block type. The stronger the sealing ability of the fault is, the stronger the ability to block the oil and gas is.

Through Block T21-7-3 profile (Figure 3), we can know that the reservoir of Block T21-7-3 is structural lithologic reservoir which is controlled by the reverse fault. The reverse fault sealing has not been destroyed. It prevents oil and gas from migrating. So the reservoir can be preserved.

5. Conclusion

Applying logging data, seismic data and neighborhood stratification results, based on mark bed control, electrical characteristic curve combination to sedimentary cycles, using the principle of sequential control, to subdivide NI Reservoir in Block T21-7-3. 4 pay zones and 25 layers are divided.

By using well data and seismic inversion data, analyzing the distribution of sand in Block T21-7-3. NI3 and NII9 are the thickest layer in the three pay zones of Block T21-7-3. Because of the sand development, the continuity of the horizontal distribution of the reservoir is poor. Major subzone of Pay zone I is NI3, major subzones of Pay zone II of are NII1, NII2 and NII8.

With oil and gas drilling data and hydrocarbon shows, summarizing reservoir type and oil and water distribution of Lower Section of Lower Zuunbayan Formation in Block T21-7-3. Vertically, oil is mainly concentrated in Pay zone I and II of NI Reservoir, oil bearing formations is lower with elevation depth increases; generally with the feature of "oil up water down" or "oil up dry down"; the lower layer is mainly water layer. Further studies showes that source rocks, sand and fault are controlling factors affecting the distribution of oil and gas.

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