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Several opinions on reservoir evaluation of X Oil blocks

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Abstract: Analysis and summary reservoir evaluation in X Oil blocks, and then rethink structural pattern by using three-dimensional seismic data to process and explain; Recognize the sand body distribution of dense well anatomic and sedimentary once again; With analysing explicitly well testing, oil testing and logging, oil-water distribution of block is more learned; After discerning test mining and test area information to recognize initial production, it will provide a certain reference value to block evaluation and development work.

Keywords: *reservoir evaluation Structural Features sedimentary oil-water distribution*

I. INTRODUCTION

Reservoir evaluation stage is the convergence phase of exploration and development, on the basis of full recognition geological regularity of oil field to preparate for intial development, and then submit proved oil reserves and initial development program, it can provide scientific and reliable support for oil development. This paper summarizes reservoir evaluation in X Oil block and hope to exchange the knowledge with others.

II. SEVERAL OPINIONS OF RESERVOIR EVALUATION

2.1 Recognition of tectonic framework

In view of its technology and information restrictions, two-dimensional seismic data can not recognize the fault between 5 and10m, the extended length of small faults is greater than 150m (three blocks) of and shut height of small amplitude structure is about 10m; At the same time, sand and effective thickness can not be quantitatively predicted. Three-dimensional seismic data successfully solves the above problem to provide a guarantee for The implementation of a movable geological reserves.

2.1.1 3-D seismic data interpretation results

The major of X Oil blocks is a relatively simple monoclinic structure, and its local structures are not very developed, 6 main structural traps and the larger 11 major faults are explained. From T2 and T2y1 layer structure, structural morphology and oil distribution of fracture control can be learned, the structural traps is not developed in the region, only a few scattered small amplitude distribute along the fault structural traps,but production wells is not almost fall in these small structure region, it shows tectosphere is not the main control factors in the region.

2.12 Fault and lithology are the main factor that control oil and gas

There are lots of fauls in this area, the direction mainly is NNE, NNW,NW. Through the analysis of the sedimentary micro facies, the direction of sand is NW, a certain angle and the fault strike, Sand is cut by fault and compound fault-lithologic reservoir, this kind of reservoir is the most important types of reservoir in this area.

One well is 1546.2-1634.0m in FuYu oil layer, everyday there is 8.703t oil through lift gas pressure. From the structural point of view, the well is located in the eastern area and is the drop plate of the ZH72 fault, do not

have the conditions of structural trap. From the point of view of reservoir conditions, the well has the thickness of sandstone 28.6m in objective layer, the effective thickness is 8.8m, reservoir property is good, effective porosity is 10.9%, is the fault- lithologic reservoir by the fault barrier.An Eastern oilfield as the effective thickness of the high value area, In the upper of ther FI layer and the lower of FII obtain industrial oil flow 4.783t. This well match the NNW and NNE faults, easy to form the fault- lithologic reservoir, which is the fault-lithologic reservoir of favorable development area.

2.13 Sand lens reservoir type is secondary

According to the reservoir characteristics, the sandstone lens, strip in sand with sand body, vertical sand mutually staggered, lateral connectivity is poor, with the formation of lithologic reservoirs and stone lens conditions.

One well has 2.02t oil flow everyday in FuYu oil layer, according to the reservoir characteristics, reservoir property is good, effective porosity is 11.1% and 12.1%. From the structural point of view, there is no fault around the well, belongs to lithologic reservoir sand body of lens. Designing development program is very significant for the economic development of oilfield.

2.1.4 Prediction of sandstone enrichment region

F Ⅰgroup sand body development regularities: F Ⅰgroup sandstone thickness of 3.8-3.8 m, 18.92 m on average. In the middle of the work area develop a south west - north east direction of sandstone development zone, development zone sandstone thickness are in more than 18 m.

F Ⅱgroup sand body development regularities: F Ⅱgroup sandstone thickness of 0.8-0.8 m, 9.85 m on average. F Ⅱgroup of sand bodies in the region development of the overall, in the western part of the work area, central relative development.

2.2 Sedimentary characteristics recognize

2.2.1 Sand body direction

According to a certain oil field blocks that the existing six dip logging data in table 7-2 confirmed sand body is in the south west ~ east north ; With two Wells imaging log interpretation results, seismic reservoir prediction results, dense well pattern anatomy determine sand body in the same direction. Sand body by the thickening of south west north east direction, sand body width 100m ~ 2000m, extending 2 km ~ 3 km. Direction of sand body is in the north east ~ south west , the same direction with river swing.

According to11 exploratory well, 41 appraisal well, 153 development wells dense well pattern anatomical sand body development in a certain oil field blocks, there are three major reservoir, F Ⅰ31, F Ⅰ71, F Ⅰ72 layer, sand body into a patchy distribution, drill encounter rate was 50.93% ~ 67.08%, the second type reservoir has 2, F Ⅰ4, F Ⅱ41 layer, sand body distribution into a strip, drill encounter rate was 23.60% ~ 23.60%, the remaining 20 layers for third kinds of reservoir, into a lenticular sand body distribution, drill encounter rate is low, is 0.62% ~ 21.12%.

2.2.2 Sedimentary microfacies

According to the regional geological research results in zhaoyuan area south fuyu oil layer deposition by huaide sedimentary system control, and again by the north and the south to the east of the songhua river water system constraints, delta distributary plain facies development in zhaoyuan area . According to a certain oil field blocks in fuyu reservoir depositional cycle characteristics of log facies, lithology combination, the color of the core analysis, stratification structure, fossils contained content characteristics, according to the causes of types of single sand bodies, the delta distributary plain was divided into facies channel, interchannel, natural

levee, crevasse splay and other four kinds of sedimentary microfacies model and sedimentary microfacies are according to the division of sedimentary units.

2.2.3 Main sedimentary microfacies in the reservoir, it can be seen that:

FI71 sedimentary period is a period of great prosperity development of the river course with underwater distributary channel sand body , the main development of 4-5 south west - north east to the channel sand body distribution, single sand body thickness of 7.2 m (yuan170-326 well), full wellblock drilling encounter rate 67.08%, distributed staggeredshape. Between the river is given priority to with interchannel sand deposit.

F Ⅰ72 Sedimentary period was main development of the channel and underwater distributary channel sand body , the main development of 2 south west - north east to the channel sand body distribution, the thickest of single sand body to 6 m (yuan 256-272 well), fullwell block drilling encounter rate 55.9%, sand body distribution staggered shape.

F Ⅱ41 sedimentary period was the delta distributary plain deposits in this area. ,develop extensive channel sand body and underwater distributary channel sand body, the main development 3 of south west north ~east to distribution channel sand body, drilling encounter rate 23.6%, sandstone thickness 1.0-6.2 m.

The main body of a certain oil field blocks in fuyu reservoir sandstone concentrated development in F Ⅰgroup lower part and F Ⅱgroup lower part, the rest of the small layers of sandstone development, but the thickness is small, scattered distribution, on the main sandstone development zone was the longitudinal channel superposition type, the plane in zonal distribution.

2.3 The understanding of the oil and water distribution

A certain oil field blocks oil-water longitudinal was controlled by gravity differentiation, the overall distribution characteristics was upper oil lower water and upper oil lower dry, rare oil water layer. Most of the water head in the bottom of fu one group and the upper of fu two group. the upper of water top was oil layer ， poor layer, water layer, dry layer mutual combination. In each well oil column height change is bigger, fuyu reservoir oil-bearing height at 34.9 ~ 155.0 m, 102.7 m on average. But the relationship with the structure is not very obvious. Among wells without unified oil-water interface, the bottom of the oil in the -1349.1 ~ -1648.8 m above sea level, an average of 1534.6 m, the water top average depth between 1492.96 ~ 1685.2 m above sea level, an average of 1576.19 m. Oil and water distribution is controlled by structure and lithology.

Serial number	Well No.	Bushing elevation m)	F topper	oil pan				water Top		
				Sump depth（m）	Oil column height（m）	Altitude (m)	Horizon	depth of the water（m）	Altitude (m)	Horizon
1	a	130.60	1451.50	1593.40	141.9	-1462.8	FI6	1634.2	-1503.6	FII1
2	b	131.00	1563.50	1613.20	49.7	-1482.2	FI4	1816.2	-1685.2	FII5
3	c	131.60	1535.00	1644.60	109.6	-1513.0	FI7	1699.2	-1567.6	FII5
4	d	132.20	1632.00	1715.40	83.4	-1583.2	FI5	1751.2	-1619.0	FII1
5	e	130.70	1613.50	1648.40	34.9	-1517.7	FI2	1690.4	-1559.7	FI5
6	f	130.10	1627.00	1745.60	118.6	-1615.5	FI7	1754	-1623.9	FII1
7	g	132.30	1625.00	1752.40	127.4	-1620.1	FII2	1807.4	-1675.1	FIII2
8	h	130.80	1593.50	1731.40	137.9	-1600.6	FII2			
9	i	131.91	1633.50	1730.20	96.7	-1598.3	FI6	1733.2	-1601.3	FI7

10	j	132.50	1536.50	1691.00	154.5	-1558.5	FII4			
11	k	131.70	1535.00	1690.00	155.0	-1558.3	FII3			
12	l	132.10	1485.00	1631.80	146.8	-1499.7	FII4			
13	m	130.30	1495.00	1605.40	110.4	-1475.1	FI7			
14	n	131.20	1574.50	1675.00	100.5	-1543.8	FI7	1705.2	-1574.0	FII3
15	o	133.80	1496.00	1619.20	123.2	-1485.4	FI6	1645.6	-1511.8	FII4
16	p	129.90	1542.00	1612.20	70.2	-1482.3	FI4	1626.2	-1496.3	FI5
17	q	132.50	1372.00	1481.60	109.6	-1349.1	FI7			
18	r	141.67	1615.2	1679.6	64.4	-1537.9	FI4	1738.4	-1596.7	FI7

2.4 Productivity prediction

Study has 34 industrial oil wells,on the Fuyu reservoir, all industrial oil wells after fracturing. The single well perforation variation range of the effective thickness in the range of 1.9 ~ 22.5m, the average effective perforation thickness is 7.8m, the average single well test oil yield was 3.24t/d, the average recovery of 0.42t/ intensity (D-M). The intensity of a stable oil production wells 0.23t/ (D-M), adjacent block production wells during the initial production production intensity 0.12t/ (D-M). The comprehensive analysis of the results and test data, oil test data and production data, consider the use of advanced water injection, large scalefracturing, at the beginning of operation, stable oil production intensity at 0.2 t/ (D - M) calculation isreasonable.

Block	The number of producing wells)	Thickness (m)	Initial oil production (t)	2004.12			2005.6			2005.11			Single wellDaily oil	Oil production rate (%)
				Daily fluid	Daily oil	Daily water	Daily fluid	Daily oil	Daily water	Daily fluid	Daily oil	Daily water		
T	45	11.5	2.4	103.2	77.9	24.5	54.1	40	26.1	47.9	34.4	28.2	0.82	0.83
W	12	12	2.1	13.9	9.1	34.5	5.1	4.5	11.8	6.0	4.3	28.3	0.3	0.61
Y	13	8.3	1.9	12.6	2.8	77.8	6.1	2.8	54.1	6.9	3.0	53.8	0.23	
S	6	7	0.8	4.1	4.1	0.9	2.3	1.9	17.4	2.2	2.2	0.6	0.4	0.44
total	76	10.7	2.2	127.5	87.6	31.3	67.6	49.2	27.2	63	43.9	29.8	0.6	0.77

III. APPLICATION IN OILFIELD DEVELOPMENT

The study area is mainly lithologic oil reservoir, Structural lithologic composite reservoir is secondary. The main oil-bearing formation for Fu Yang, Reservoir distribution in space is not stable. During oil field exploration and development, gradually exposed the problems of sand body distribution of lateral connectivity, longitudinal thickness change quickly, In reservoir evaluation stage, the oil test data, optimize the development objective layers, the distribution of oil and water clear development block, provides the reference for the oilfield development; Based on the existing proven reserves, combined with the understanding of the above, the reasonable design and development program, has important significance for economic and effective development of oilfield.

IV. PROSPECTS

For tectonic, sedimentary, oil water distribution, reservoir types, dynamic test data analysis, concluding can provide reliable basis for establishing a reasonable reservoir model, so as to guide the scientific and reasonable development of oilfield.

Combining oil source condition, fault condition, reservoir condition, hydrocarbon accumulation and production well and so on, providing guidance to the research area of water development planning.

The use of well test analysis results to establish the dynamic geological model for reservoir prediction is reasonable, at the same time using the probe radius, boundary conditions, can provide a reliable basis for reasonable development plan; using dynamic test data to judge reservoir scale, given the production intensity, flow pressure parameters；Using material balance method is for single well controlled reserves, for oilfield development to provide first-hand information, in the broad application prospect in oilfield development.

V. CONCLUSIONS

Reservoir evaluation is the binding site between exploration and development, playing a decisive role. The real effect of the level of awareness of the underground decided to develop the, therefore, reservoir evaluation work is of great significance.

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