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Research Paper

The SA0 Group Reservoir 'S Compositive Evaluation In The Central Developing Part In Sa Area

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ABSTRACT: *Using the data from logging in a net of high density, the sand core from a airtight well, and the testing data for oil and gas , and then according to the experiment of exploitation, we studied the deposit visage in macroscopical way, the physical characteristics of the reservoir, and the partition of the oil and gas's border. It is clear that the zero group of Sa's oil floor is mainly deposit in the foreside of a delta under the background of lake incursion, and the ventro-delta express a character that there were some sandstones which was transited for two times. Make a certain that the oil and gas's border of zero group in Sa is maybe 600m underground, and demarcated the maximal square is 26.8km^2 about this reservoir, and tell us that it lies in the top of the anticline. Of course, this production can be used in the designing of the zero group of Sa's exploitation.*

Keywords: *The zero group of Sa, Deposit character, Oil and gas border, Delta front deposits, The secondary handling*

I. INTRODUCTION

The oil formation of SA0 formation is the uppermost oil-bearing layer in the middle part of Daqing Changyuan. It has not been studied deeply and systematically. For the purpose of tapping the potential of Changyuan, the reservoir of SA formation has been studied. Based on the data of 5 sealed coring wells, the new and old thickness interpretation standard of resistivity was developed. The thickness of 9475 wells was divided, a fine geological database was set up, 12 blocks, 8 sedimentary units' 96 sedimentary facies belts were plotted. Using 4 oral oil test and 4 neutron neutron logging data, the oil and gas boundary of SA0 formation was determined. Using the porosity of 96 samples from 5 coring wells and the original oil saturation of 87 samples, the physical parameters of reserves were determined. We calculated geological reserves by different sedimentary units, different sand bodies and different thicknesses. In order to improve the development level of SA0 group, the sedimentary characteristics, the distribution of oil and gas and the reserves were determined.

II. RESERVOIR CHARACTERISTICS OF SA0 FORMATION

Initial deposition of Nenjiang formation, Songliao basin had entered the depression development heyday, The lake was rapidly expanding, the lake was vast, and the whole basin had deep water deposits. This was the second large-scale lake invasion[1], which occurred after a period of the qingshankou in songliao ancient lake. Under this background, there were 3 brief lacustrine depression events in the early and middle periods of the Nen1 formation, and the delta front deposits were formed in the Daqing Taikang area, That is, the upper and lower levels of SA0, and SA1 sets.

2.1 Lithology, physical property and oil-bearing characteristics

2.1.1 Lithologic characteristics

Through the identification of sandstone slices in coring wells, the rock size of SA0 formation was 0.03 ~ 0.12mm, the total mass fraction of detritus was 77.8%. The separation was good, the grinding roundness was sub circle, the color was grey to grey brown, the pore cementation was point contact, the feldspar weathering degree was medium, and the shale mass fraction was 11.7%. It was determined that the reservoir mainly consists of silt and argillaceous siltstone, and contained some fine middle sandstone with higher calcium content and higher mud content.

2.1.2 Physical characteristics

Reservoir permeability was the most important physical parameter that affects the development efficiency of oil field water injection. The average permeability was about 12.1×10-3μm^2 for nearly 200 core samples. Based on coring well test data, respectively made permeability - sorting coefficient, permeability - shale mass fraction, permeability - median value of grain size 3 relationship chart, using multiple regression analysis method: The main lithologic factors affecting the permeability of SA0 formation were shale mass fraction, and the correlation factor was 0.73.

The determination of the original oil saturation and porosity was based on the porosity of 96 samples in the coring well and the original oil saturation of 87 samples. Porosity: sandstone was 19%, effective was 20.3%; original oil saturation: sandstone was 38%, effective was 50%, porosity and original oil saturation was lower than SA group, as table 1.

Table 1 Comparison of physical parameters between SA0 group and SA1 group

Reservoir group	Effective porosity /%	Original oil saturation /%	Surface crude density /t/m^3	Volume factor of crude oil	Single factor
SA0 group	20.3	50．0	0.849	0.892	7.7
Sheet in SA1 group	23.0	68.1	0.856	0.892	12.0

2.1.3 Oil-bearing characteristics

We had calculated the oil producing attitude of 5 coring wells, and the results are shown in table 2. We could see that the untabulated reservoir oil occurrence mainly in oil, grease, the thickness of the total thickness of 76%, oil and oil thickness accounted for only 24%. The oil layer was mainly composed of silty sandstone, followed by the clay siltstone, the oil leaching and the oil patch are mainly composed of muddy silty sand, and the oil trace layer mainly was mainly silty shale.

Table 2 Distribution of oil-bearing behavior in SA0 formation

Well number	Surface reservoir thickness /m					Apparent reservoir thickness /m				
	Oil	Oil immersed	Oil stain	Grease marks	Total thickness	Oil sand	Oil	Oil immersed	Oil stain	Total thickness
Gao127-Jiangeng 283	0.3	0.9	1.7	1.2	4.1		1.2	0.3		1.5
Zhong34 2-Jian21		0.6	2.7	2.0	5.3					
Zhong35 3-32		1.0	0.9		1.9		2.8			2.8
Zhong35 2-28			1.0		1.0				0.4	0.4
Zhong35 0-28	0.2	1.4	1.7	2.7	6.0		0.6	1.0	0.1	1.7
Total	0.5	3.9	8.0	5.9	18.3		4.6	1.3	0.5	6.4
Total thickness /%	3	21	44	32			72	20	8	

2.2 Macroscopic distribution characteristics of sand bodies

2.2.1 Classification and correlation of reservoirs

According to the cycle of contrast, the principle of hierarchical control of reservoir classification and correlation[2], extrapolating from the coring well or standard well, the factors of lithology combination, cycle characteristics, electric curve characteristics and formation thickness were comprehensively considered.According to this principle, SA0 formation in the longitudinal direction was divided into 2 sandstone group, 8 small layer in the mud layer SA03 ~ SA04 there was an approximately 8 m, which was divided into upper and lower two sandstones, namely S01 to S03 on the SA0 sandstone group and S04 ~ S08, minus sandstone group.

2.2.2 Macroscopic sedimentary features of skeletal sand bodies

We drew the sedimentary facies map of each unit, and used the data of 9475 wells in the well pattern in the middle part of the area, observed and analyzed the core data with the sedimentology theory. Finally, it is determined that the formation of delta group is mainly delta front deposit in the lake invasion background, and the turbidite sand bodies which are transported two times in different parts of its front delta.

SA08 layer: After a widespread lake transgression between SA0 and SA1, the rapid deposition of the lake occurred at the time of deposition of the SA 08 layer, the rapidly advancing delta formed an unstable lateral leading edge sand with poor lateral continuity, and distributed as net or banded. Occasionally, isolated sand like distributary channels were distributed sporadically, but only the distributary channel sand bodies in the north section of the north were developed, and the scale is small. The rate of sand drilling was 0.1%, and the rate of drilling with sheet sand was 40.2%. The drilling rate of sheet sand was 18.7%, and the point of well killing was 40.9%.

SA07 layer: As the lake retreats, the distribution of sand bodies was enlarged and the continuity was enhanced. There were obvious zonal distributary channel sand bodies in the western part of the northern one or two row, the western part of the north, the Central West, the Central East and the South one, and gradually transited to intermittent lump sand bodies, thin sand in the form of sheet sand as the main body, a wide range of distribution. The rate of sand drilling was 2.6%, and the rate of drilling with sheet sand was 68.1%. The drilling rate of sheet sand was 14.5%, and the point of well killing was 14.7%. SA06 layer: The continuity of sand bodies was poorer than SA07, the channel sand bodies did not form a continuous strip, but only a discontinuous distribution of lump, compared with SA07, the distribution range of sheet sand in the table decreaseed, while the area of the outer sheeted sand increaseed. The rate of sand drilling was 0.6%, and the rate of drilling with sheet sand was 52.1%. The drilling rate of sheet sand was 19.6%, and the point of well killing was 27.7%.

SA05 layer: The lake began to enter rapidly, and the distribution of sand bodies decreased rapidly. Sheet sand was only in the north one or two row and north section of a small area of banded, and other areas were large area of the tip out. The rate of sand drilling was 0, and the rate of drilling with sheet sand was 9%. The drilling rate of sheet sand was 8.3%, and the point of well killing was 82.7%. SA04 layer: With the further expansion of the lake, Changyuan was all located in shallow deep lake area, the development of sheet sand was scattered. The rate of sand drilling was 0.2%, and the rate of drilling with sheet sand was 10.6%. The drilling rate of sheet sand was 12.3%, and the point of well killing was 76.9%. During this period, there was a short sedimentary pause at the end of the delta deposit, and a stable distribution of calcareous deposits at the top, forming a mud layer of about 8m thick, and dividing the SA0 component into two upper and lower sandstone formations.

SA03 layer: This was the product of a new round of Lake retreat, with a small margin of retreat. The unstable sheeted sand bodies at the outer edge of the delta were scattered only sporadically, while the rest of the large area was pointed out. The rate of sand drilling was 0, and the rate of drilling with sheet sand was 3.2%. The drilling rate of sheet sand was 5.3%, and the point of well killing was 91.5%.SA02 layer: With the withdrawal of lake, sand extended southward, continuous variable sand sheet was better, However, the size of the lake returns was smaller than that in SA0 underpart, and the sand bodies will be distributed widely in the central region. In the eastern part of the north, Central East, South one block, a longer strip channel sand body appeared with larger thickness. The rate of sand drilling was 2.2%, and the drilling rate of sheet sand was 17.2%. The drilling rate of sheet sand was 18.4%, and the point of well killing was 62.2%.

SA01 layer: The basin began a new round of lake entry, and there were no normal deltaic deposits on Changyuan. There were only some loose potato shaped and banded sand bodies. The rate of sand drilling was 0.2%, and the rate of drilling with sheet sand was 2.3%. The drilling rate of sheet sand was 2.3%, and the point of well killing was 95.2%.The development characteristics and distribution of S0 reservoir sand is: S06, S07 and S08 were the first stage lacustrine retreat products. The sand bodies were extensively developed, and the boundaries of the inner and outer front of the delta could be further divided into the small S07 layer near the west of the northern section; The second stage of lake retreat was less than the first stage. Therefore, S02 small layer sand bodies were only locally developed; S01, S04 and S05 were lacustrine products; sand bodies were sporadically developed; S03 was the product of the second stage of the early stage of lake retreat, and the sand bodies were only sporadically developed.

2.2.3 Analysis of genetic types of sand bodies

From the distribution characteristics of sand bodies, it could be seen that the characteristics of SA group were: There were often zonal distributary channel sand bodies in the outer front of the delta, and there was a thick channel sand body in the front delta mudstone when the outer front edge sand point was pointed out. For example, the S02 minor layer showed an obvious channel shaped thick sand body from the eastern part of the eastern part of the fault. It was considered that this phenomenon was not a normal deltaic deposit, but belonged to the product of the retransport and redeposition of the delta front sand. When the SA formation was deposited, the water bodies were deep and the front deltas had a certain slope. Under the excitation of tectonic movements or unexpected events (such as micro earthquakes and floods), the sand bodies at the end of the delta could be transported again. It was deposited in the deep basin with gravity flow, showing different sedimentary phenomena than normal delta. The remaining massive sand bodies still belonged to normal deltaic deposits.

III. SOME SUGGESTIONS AND SUGGESTIONS

(1) The sedimentary characteristics of SA0 formation were: The sedimentary facies were mainly delta front deposits in the lacustrine intrusion, there were two turbidite sand bodies with different degrees in the former delta.

(2) The SA0 petro interface depth was about -610m, projected to S0 top surface structural map, could delimit the gas bearing area in Sazhong development area SA0 reservoir, the maximum value was 26.8km^2 and the distribution area was located in the top of the anticline.

(3) The research results of the reservoir reservoir study could be applied to the development design of the SA0 group to improve the development level of the SA0 group.

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