Sequence Stratigraphic Framework Analysis of Putaohua Oil Reservoir in Chaochang Area of Songliao Basin

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Abstract. The regional structure of the Changchang area in the Songliao Basin is located on the Chaoyangou terrace and Changchunling anticline belt in the central depression of the northern part of the Songliao Basin, across the two secondary tectonic units of the Chaoyanggou terrace and Changchunling anticline. However, with the continuous development of oil and gas, the unused reserves of Fuyu oil reservoir decreased year by year, and the oil field faced a serious shortage of reserve reserves. At the same time, during the evaluation process, a better oil-bearing display was found during the drilling and test oil in the Putao depression to the Chaoyanggou terraces, the Yudong-Taipingchuan area, and in the process of drilling and testing oil in the Putaohua reservoir.Zhao41, Zhao18-1, Shu38 and other exploration wells to obtain oil oil, indicating that the area has a further evaluation of the potential. Based on the principle of stratification, the Putao area was divided into three parts by using the core, logging and logging. It is concluded that the middle and western strata of the study area are well developed, including three sequences, one cycle from bottom to top (three small layers), two cycles (one small layer), three cycles (two small layers) Rhythm is positive-anti-positive. From the Midwest to the southeastern part of the strata, the strata are overtaken, the lower strata are missing, and the top rhythms become rhythmic.

1. Introduction

After oil and gas fields are put into development, oil and gas field development plan design, oil and gas reserves calculation, stratigraphy, well pattern adjustment, oilfield exploitation dynamic management (stratified oil production, stratified water injection, stratified distribution, stratified testing, stratified fracturing Layer water shutoff, stratification acidification ...) and so on are in the formation, reservoir division and comparison results based on the.

Stratigraphy, reservoir division and comparison method, is the basis of oil and gas exploration geology and oil and gas field development geological work. As the underground geological situation of ever-changing, people can not now through a simple, mechanical, computational method to complete. Only the use of a large number of (multi-faceted), direct (core), indirect (geophysical exploration) information, through comprehensive, analytical, laboratory, comparison can be completed. Therefore, stratigraphy and reservoir division and contrast is a difficult and complex work. In recent years, the exploration and development process, the main exploration area in the long area of the Fuyu
reservoir, after years of evaluation, has used reserves accounted for 82.36% of proven reserves, oil field facing a serious shortage of reserve reserves. In the slope area of the Sanzhao depression to the Chaoyanggou terrace, the Yudong-Taipingchuan area has found a better oil-bearing display in the process of drilling and testing oil in the Putaohua reservoir, and has great exploration potential. At the same time, due to the large change of the strata in the Chaoyanggou terraces, the difficulty of the stratigraphic comparisons is increased. Therefore, it is necessary to find out the stratigraphic comparisons of the stratigraphic sediments, the study of oil and gas distribution and the prediction of favorable areas.

2. Regional Geological Survey
The Songchang Basin is located in the area of Zhaoyuan, Zhaozhou and Zhaodong three (city) counties in Heilongjiang Province. The western part is connected with Zhaozhou and Zhaoyuan oilfields. The northern part is adjacent to the Yushu Lin oil field. The main body of the evaluation area is in Chaoyang Gutter on the ground, the exploration area of 1 450 km squared. The area is flat, the ground elevation of 125 ~ 185 m, a large area for farmland coverage, the southwest mostly reservoirs, swamps. The long area belongs to the continental monsoon climate, the annual average temperature is 3.6 ℃, the annual precipitation is 440mm, the annual frost-free period is 140 days. The northwest of the oil field is connected with the Harbin-Dalian Expressway and the traffic is relatively convenient.

The Zhaogang area is located on the Chaoyanggou terrace and Changchunling anticline belt in the central depression area of the northern part of the Songliao Basin, across the two secondary tectonic units of the Chaoyanggou terrace and Changchunling anticline. The main tectonic units in this study area are Chaoyanggou terrace and Sanzhao depression (Fig. 1).

3. Sequence stratigraphic division

3.1. Establish standard wells
The so-called standard wells, also known as typical wells, the necessary conditions for the location of the center, the formation is complete, and there are more than the whole core logging data, well logging data, curve signs clear. In the study area, the East 11 wells of the Shangjia block in the long area are selected for the different strata, the tree 30 of the tree 25 block, the 7th well of the Taiping Chuanan block, the Sichuan 4 well in the Tai Ping Chuan block, and the Fengle district (Fig. 2), and more than 300 wells, evaluation wells and development wells in the whole area were divided into two groups. In order to avoid the confusion, Appropriate adjustment.
3.2. Small division principle
The division and comparison of the oil group in this study is based on the lithospheric and electrical properties of the lithology and the standard layer under the control of the boundary line and the standard layer. Specific include the following aspects.

3.2.1. Determine the deposition cycle. The so-called sedimentation cycle is in the stratigraphic section, similar to the vertical lithology in the regular phenomenon of repeated. This is regularly repeated, can be in the rock color, lithology, structure, structure and other aspects of the show, the most obvious is the performance of the rock particle size, called rhythm. The sedimentary cycles are mainly due to the periodic movement of the crust, which can be divided into positive and negative cycles and complete cycles.

3.2.2. Standard layer. Standard layer refers to the stratigraphic section in the thickness of thin, significant electrical characteristics, stable distribution of fine particles. Such as mudstone, oil shale, thin layer of limestone and dolomite, coal, tuff and so on. The standard layer is generally isochronous. Therefore, if there is a better standard layer, should be fully utilized. In general, the standard layer is at the top and bottom of the cycle.

3.2.3. Formation thickness. During the deposition process, the change of formation thickness is controlled by the deposition rate and sedimentary topography. Overall the thickness of the formation is a regular change, the difference is that this change is fast or slow. If there is no regular change in the thickness of the formation, in most cases there is a problem with stratigraphic division. Therefore, in the course of comparison, we should fully take into account the regular changes in formation thickness.

3.2.4. Determine the special lithologic section. Special lithologic sections can be used as a basis for comparison of large sets of controls. It is required to be stable in the profile, and the logging signs and curves are clear, such as the salty salt section, the bioclastic rock section and the volcanic rock section in the clastic rock section.

3.2.5. Determine the division principle. Based on the above theory, we have adopted the following principles (Fig. 3) in the study of the stratigraphic comparison of the Changhua block Putaohua oil layer.
Figure 3. Putaohua oil reservoir small layer division of Dong11 drill hole

1. Based on the sedimentation cycle, the sand body is the unit, the marker layer is controlled, and the thickness of the formation is combined.
2. On the basis of the original layered understanding, the exploration of the wells compared to the unreasonable wells to adjust.
3. On the base control of the overlying strata to take the top flat at the uneven, in the unconformity surface up and down, try not to break points.
4. On both sides of the sandstone pinch area to consider the effect of compaction, that is, the same layer of sandstone thick mud thin.

Specific division method mainly through the following two aspects:
1. To establish a standard integrated columnar profile or a representative standard single well profile, with a standard well extrapolation.
2. Rely on logging curve, lithology, rotation and seismic profile of the corresponding, select the skeleton profile, the establishment of vertical and horizontal standard even well profile.

3.3. Establish and compare the formation of the Lianjing formation

The division of single well oil group and the identification of oil interface reflect the change of sediment type and formation thickness and the change of sedimentary system in vertical direction of single well. In order to further understand the distribution characteristics of the formation and lithology of the reservoirs in the study area, it is necessary to carry out the analysis of the strata in the study area. The study area is mainly controlled according to the core data, logging data and logging data, and is controlled by the group → segment → oil layer → small layer. The surface is guided by modern sedimentology research. Lithologic well data, based on natural potential, natural gamma, shallow side and logging data, from point to line, by line and face, point, line, surface combination, mutual penetration of the contrast method for the region Segmentation.

According to the research requirements, we selected six east-west and even well sections and seven north-south vertical well profiles to carry out the comparative analysis of the Putaohua oil layer, the study area of the Putaohua oil layer is divided into six small layers. One of the east-west and north-south respectively, select a show (Figure 4, Figure 5).
The thickness of the single layer is usually 2-4m in the small layer of the Putaohua oil layer in the study area, and the thickness of the single layer is generally 2-4m. In the Shangjia, Shu 25, Taipingchuan, Fengle, Zhaoyuan South, The development of several blocks in Yuxi is relatively complete, but from the north to the south, to the Chaoyanggou terraces, the thickness of the strata is gradually missing, and the sediments of the Sanzhao depression are reduced to two small layers.

The comparison of the vertical and horizontal strata thickness changes in the vertical and horizontal strata, and the strata in the southeastern part are missing and are generally missing only P1 and P2. The northern part of the study area is thicker and the strata in the southern region are thinner.

4. Stratigraphic characteristics and distribution rules
The Putaohua oil layer is one of the strata of the Yaojia Formation in the Songliao Basin and is one of the main producing layers in the northern part of the Songliao Basin. Its thickness is generally 20 ~ 30m. In the study area, the influence of the tectonic uplift at the end of the Nenjiang River, The thickness of the north is high, the thickness of the northwest is 20 m, and the thickness of the southeastern is about 10 m, as shown in Fig. The thickness of each layer changes little, generally single layer thickness of 2 ~ 5 m. In the whole area, P1-P2 is thicker than the whole (Fig. 7 to Fig. 8). In the southeastern part of P3-P6, the strata are missing due to tectonic uplift (Fig. 9 to Fig. 11).
5. Conclusion
From the sequence stratigraphy, the central and western strata of the work area are well developed, including three sequences, bottom-up 1 cycle (3 small layers), 2 cycles (1 small layer), 3 cycles (2 Small layer), the overall rhythm is positive - anti - positive. From the Midwest to the southeastern part of the strata, the strata are overtaken, the lower strata are missing, and the top rhythms become rhythmic.

The Putaohua reservoir is one of the strata of the Yaojia Formation in the Songliao Basin and one of the main producing areas in the northern part of the Songliao Basin. Its thickness is generally 20 ~ 30m. In the study area, the influence of the tectonic uplift The thickness of the oil layer is high in the north and south, and the thickness of the northwest is 20 m and the thickness of the southeastern is about 10 m. The thickness of each layer changes little, generally single layer thickness of 2 ~ 5 m. In the whole area, P1-P2 is thicker than the whole; P3-P6 southeast due to structural uplift, formation tilt.
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