

Study on the minor structures in Huangjindai Oil Field

Qi Zhenru¹, Shi Shangming², Liu Xiaowen³

[1] Geoscience College of Northeast Petroleum University, Daqing, Heilongjiang, China.

[2] Geoscience College of Northeast Petroleum University, Daqing, Heilongjiang, China.

[3] Geoscience College of Northeast Petroleum University, Daqing, Heilongjiang, China.

*Corresponding author

Abstract: In order to achieve the development effect with high speed and high efficiency of the Huangjindai Oil Field, and the further refined interpretation on the reservoir, the paper directly draws the minor structure of the reservoir with the actual data of the top surface of the reservoir, and divides the types of the minor structures, and statistical area slight relief structural features. In this paper, the total output is processed to get the average thickness of the annual cumulative output. At the same time, the initial investment and production data of the wells at different positions of the minor structures were statistically analyzed. In this paper to illustrate the relationship between the minor structures and the production capacity of oil and gas. The results show: The cumulative production capacity of positive minor structure is higher. The cumulative production capacity of negative minor structure is lower. The cumulative production capacity of monoclinal minor structure is the middle. And in the positive and negative two kinds of structural types of small and medium - sized broken nose and small broken groove have a high cumulative production capacity. Finally come to that the micro structure of the Huangjindai oil field has obvious control effect on the oil well production capacity, and has a great influence on the distribution of oil and gas. In the vicinity of the fault, the fault sealing is favorable to the accumulation of oil and gas.

Keywords: Huangjindai Oil Field, Minor structure, Small broken nose, Small high spot

I. INTRODUCTION

In the research of oil field geology, Structural research is an essential part of the content. Most of the current oil field structure map is based on the standard of the top surface of the standard layer, the construction of a large contour spacing, 20~50 m, It is relatively rough, and it is difficult to accurately reflect the small changes of structure, the actual is a macro structural map. In order to further elaborate explanation the oil reservoir, this study constructs the contour interval 5m, and carries on the micro amplitude structure (hereinafter referred to as micro structure). Micro structure is the structural characteristics of the micro fluctuation of the reservoir itself on the background of oil field structure, whose magnitude and range are small. Therefore, we directly draw small equal space structure diagram with actual data of oil layer top surface, which can eliminate the disadvantages of conventional structural map, and show the characteristics of the micro structure of the reservoir.

II. GEOLOGY

Huangjindai oil field is located in Dawa County of Liaoning Province. There are a large field, ditch multi interlaced, convenient transportation there. The structure of Huangjindai oil field is located in the southern part of east sag of Liaohe basin, west near new oilfield, and its northeast is bordered by the Yulou oilfield, and its south next to Jiazhangsi sag. There are Dongying formation (d), sand section one (S1), sand section three (S3) three sets of oil bearing gas bearing formation in the Huangjindai oil field. Dongying group, including Dong one, Dong two and Dong three sub sections. Dong two and Dong three are divided into 4 sand groups. Focus on the layer section of sand one, including the upper, middle and lower three sub section, divided into 15 sand groups, 33 small layers. The sand three section includes three sub sections, which are divided into 3 reservoirs and 19 small reservoirs. The sand two section in the study area is missing.

The area overall has run through the arch of the Liaohe rift basin Paleocene arch, from the middle Eocene to late

Oligocene rifting and late Tertiary to today's depression stage, which reflect the development and changes of the Liaohe basin is universal, and it also reflects its particularity.

III. STUDY ON THE MINOR STRUCTURES IN HUANGJINDAI OIL FIELD

3.1 Micro structure types

This study is mainly based on the classification of micro structure, which has certain effect on the development of oil field production. According to the microstructure morphology, it can be divided into positive minor structure ,negative minor structure and monoclinal minor structure.

(1)Positive minor structure: That is relative to the upper part of the oil layer, including small high spots, small nose-like folds and small nose-like faults.

The small high spots means that the top boundary of the oil layer is relatively high compared with the surrounding strata, while the contour is closed. Because it is in the local high oil layer, it is upward displacement of oil in the four directions.

The small nose-like fold refers to the higher ups and downs of the reservoir in the reservoir, and the minor geomorphology unit which is not closed in the contour,which is generally associated with minor landform units. It is closed in the three direction for the upward displacement of oil, the opening of a party for the downward displacement of oil.

The small nose-like fault in which the small nose-like fold is cut by faults in the upper inclined direction. Because it is open on the one side by the fault cutting, without the downward displacement of oil, the three directions are the upward displacement of oil.

(2)Negative minor structure: That is relative to the lower part of the oil layer, including small low spots, small groove folds, small groove faults.

Small low spots refers to the relatively low relative to the top boundary of the oil layer, while the contour is closed. Because it is in a low position,it is down oil displacement in the four directions.

A small groove fold corresponding to the small nose-like fold, whose shape and nose are relative, but in the opposite direction, in the lower lying. Because it is in the lower part of the three directions, so the three directions are down, only one direction for the upward displacement of oil.

Small groove faults refers to the small groove in the downdip direction by faults cutting. Because of its relatively low side by the fault cutting, the remaining three directions for the downward displacement of oil.

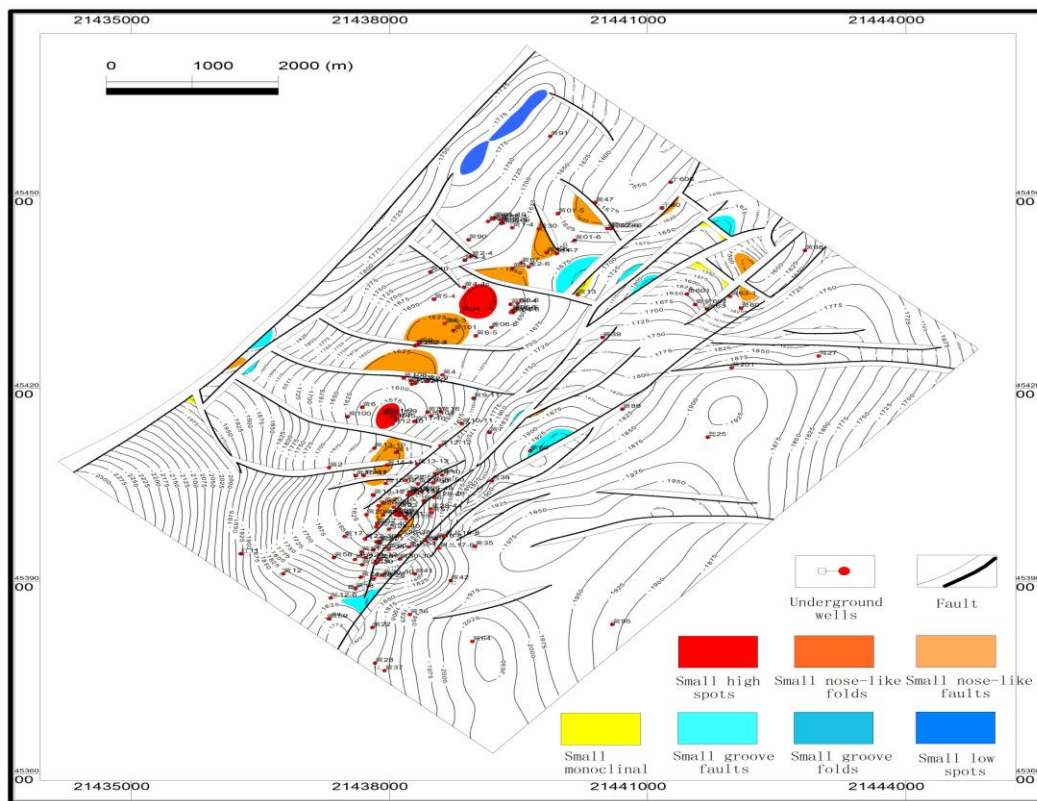
(3)Monoclinal minor structure:That is the structure appearing in formation with a certain dip angle. One direction is high, in the opposite direction is lower, and the remaining two directions are roughly parallel to the shape. It is often located between positive and negative minor structure. It can also be a separate existence.

3.2 Micro structure features of Huangjindai Oil Field

Three minor structural types were developed In the area, with positive minor structure as the main. The main types of positive minor structure are small nose-like folds and small high spots of two types. There is a certain difference in different horizons. A total of more than 30 minor structures, small nose-like faults are the most development, followed by small groove faults. D2, D3,the upper part of S1 and the middle part of S1 in the development of a more positive minor structures; The lower part of S1, S31I,S31II, and S31III develop a lot of the negative minor structures(Pic1).

Table1 Micro structure features of Huangjindai Oil Field

Developmental horizon	Positive minor structure			Monoclinal minor structure	Negative minor structure		
	Small high spots	Small nose-like folds	Small nose-like faults	Small monoclinal	Small groove faults	Small groove folds	Small low spots
D2	8	1	14	4	7		7
D3	2	0	14	5	9		2
The upper part of S1	5		19	7	15	3	2
The middle part of S1	1		13		6		6
The lower part of S1	2		3		4		3
S31 I	4	3	2	2	8	5	6
S31 II	3		13	8	14		4
S31 III	3		8	11	11		3

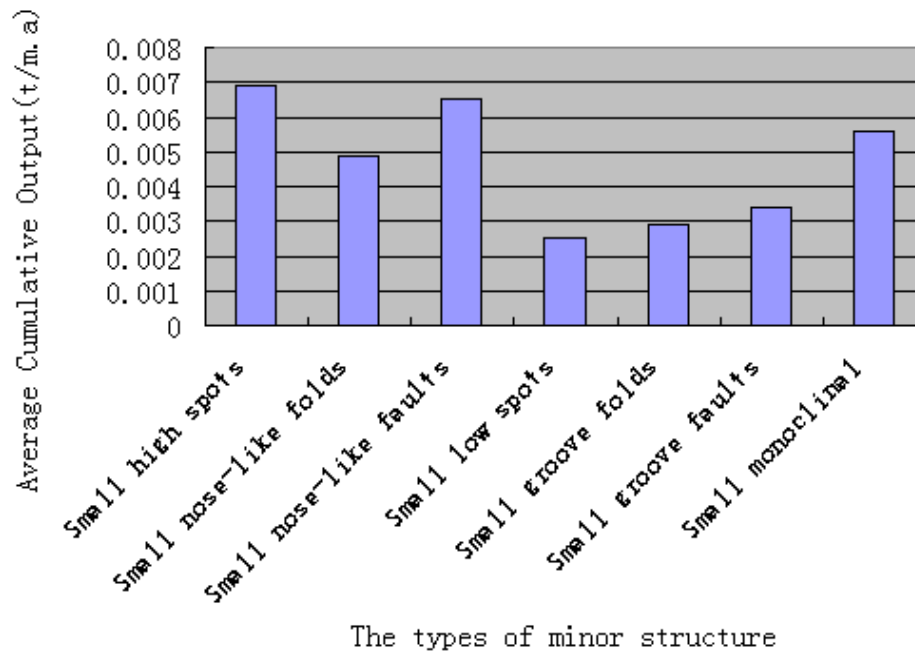


Pic 1 D2 bottom minor structure distribution map of Huangjindai oil field

IV. INFLUENCE OF MINOR STRUCTURE ON OIL FIELD DEVELOPMENT

In order to analyze the relationship between the minor structure and the production of the Huangjindai oil field, the research on the production data of the wells at different positions of the minor structure was carried out. In order to distinguish the relationship between the minor structure and oil gas production capacity, the total output is processed, and the average thickness is obtained. In this way, we can get rid of the influence of reservoir on the production capacity and production time to the impact of the production capacity, so that the law of the statistics can reflect the relationship between the minor structure and oil gas production

capacity(Pic2). In order to remove the influence of some abnormal points on the statistical law, the average value of each kind of micro amplitude structure is studied.



Pic 2 Relationship between the types of minor structure and the cumulative capacity

We can see from Pic2: In well statistics from tired generation analysis can be drawn, positive minor structural types of cumulative capacity higher, negative minor structural types of cumulative capacity is low, the monoclinal minor structural type in the middle. This shows that the minor structure has a significant control effect on the oil well production capacity .In the positive minor structure, the small high spots of the total capacity of the best, and the small nose-like faults is a slight worse than the small high spots,and the cumulative capacity of the small nose-like folds is the worst. In the negative minor structure, the small low spots are the worst, and the small groove faults are the best, and the small groove folds are in the middle. And in the positive and negative two kinds of structural types of small and medium - sized broken nose and small broken groove have a high cumulative production capacity. This shows that the structure of this region has a great influence on the distribution of oil and gas. In the vicinity of the fault, the fault sealing is favorable to the accumulation of oil and gas.

The same type of structure has a big difference in capacity, which also shows that the minor structure is not the only factor that affects the production of oil well. The production of oil well is influenced by other factors, such as the improvement of the well pattern, the relationship between injection and production.

V. CONCLUSION

This paper uses 3D high resolution seismic data and well horizon calibration data, human-computer interaction structure interpretation of Huangjindai oilfield with slice thickness and other new technologies, to high layer top surface structural control, complete integration drilling data of low amplitude structure of comprehensive study. Several understandings are as follows:

- (1)Positive minor structural types of cumulative capacity higher, negative minor structural types of cumulative capacity is low, the monoclinal minor structural type in the middle.
- (2)In the positive and negative two kinds of structural types of small and medium - sized broken nose and small

broken groove have a high cumulative production capacity.

(3)The micro structure of the Huangjindai oil field has obvious control effect on the oil well production capacity, and has a great influence on the distribution of oil and gas. In the vicinity of the fault, the fault sealing is favorable to the accumulation of oil and gas.

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