

Stratigraphic Classification and Correlation of Yan 9 Oil-bearing Formation in Baiyushan District of Jing an Oilfield

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Abstract

The stratigraphic division and comparison of the Yan 9 oil layer group in the Baiyushan area of Jing an Oilfield were carried out by using various method. Yan 9 oil-bearing formtion can be divided into two small layers, such as Yan 91,Yan 92+3.Yan 9 oil layer group is stable, and the thickness of each small layer changes little. The stratigraphic division and comparison of the Yan 9 oil layer group provides basic data for the later study of structural characteristics, sedimentary facies and sand body distribution, predicti-on of favorable areas and oilfield development.

Keywords

Jing an Oilfield; Stratigraphic Classification and Correlation; Yan 9 Oil-bearing Formation.

1. Introduction

Stratigraphic division and correlation is a basic work in oilfield development,Through stratigraphic correlation and division, various basic data of small layers can be obtained. The study of sedimentary microfacies characteristics and sand body plane distribution characteristics also needs stratigraphic correlation division as the basis. With the improvement of petroleum exploration and development in Baiyushan area, the stratigraphic correlation division is required to be more precise[1].Therefore, based on the logging and core data of more than 90 Wells in the study area, we carried out fine stratigraphic division and correlation of Yan9 oil formation in Baiyushan area, providing basic geological data for subsequent reservoir development.

2. Regional Geological Survey

The Ordos Basin is the second largest petroliferous basin in China. Its internal structure is simple. According to the geological evolution history and structural characteristics of the basin, the basin can be divided into the basic structural units such as Yimeng uplift, Weibei uplift, Western Jin Flexure fold belt, western margin thrust belt, Tianhuan depression and Yishan slope.The Baiyushan area of Jingan Oilfield is located in the middle part of Ordos Basin, structurally in the middle part of Northern Shaanxi slope. The overall area is a west-dipping monocline structure with gentle occurrence, dip Angle less than 1°, and average slope of 6-8 m/km. Locally, a nose-like uplift structure extending toward northeast southwest or east west is developed [2]. The sedimentary system of Yan9 in Baiyushan area is delta facies, and the subfacies is delta plain deposition. There are three types of sedimentary microfacies: distributary channel, channel flank and interdistributary channel.

3. Stratigraphic Division and Correlation

3.1 The Basis of Stratigraphic Correlation Division

The stratigraphic correlation and division of Yan-9 oil reservoir group in Baiyushan area are carried out by means of marker layer method, logging characteristic method, equal thickness method of formation and cyclic correlation method.In the process of stratigraphic division and correlation, the

comparison principle of "first looking for regional marker layer, then looking for auxiliary marker layer, first for large segment, then for small segment, cycle control, reference thickness, multi-well comparison, and whole area closure" was followed [3]. According to the above methods, the Yan9 oil formation in Baiyushan area can be divided into Yan91 and Yan92 +3.

3.1.1 Sign Layer Method

Jurassic Yan'an Formation coal seam is widely developed. Coal seam is formed in humid climate, reflecting the shallow water marsh sedimentary environment [4]. It can be used as an important symbol of stratigraphic division. The stratigraphic division of the study area mainly refers to the marker layer of 9 coal seams, which are widely developed in the study area with a thickness of 2-3m. The log is characterized by higher acoustic time lag, lower natural gamma, and higher resistivity (Figure 1). Therefore, it can be used as the dividing line between Yan 8 and Yan 9.

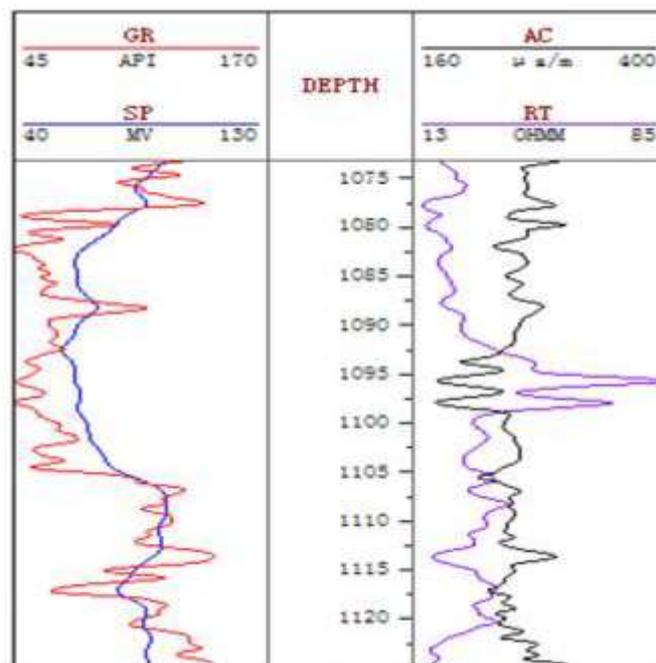


Figure 1. Indicates the 9th coal seam

3.1.2 Logging Characteristic Method

Logging curve is an important basic data for stratigraphic correlation and division, which can be used to judge rock strata, cycle and marker layer. In this formation correlation, four logging curves, namely resistivity, acoustic time difference, spontaneous potential and natural gamma, are selected to divide and compare the formation. According to the different logging characteristics of sandstone and mudstone, the lithology can be compared and the cycle characteristics of different levels can be judged, so as to carry out the division of small layers. The result of stratigraphic division and correlation combined with logging characteristics is more reasonable.

3.1.3 Equal Thickness Method of Formation

The overall tectonic activity of Ordos Basin is weak, the vertical movement of crustal sportsweat in the basin is dominant, and the overall thickness of the stratum is relatively stable, so the stratigraphic equal-thickness method can be used for stratigraphic correlation division [5]. In the study area, the strata thickness of The Jurassic extension 9 layers is 40-60m, of which the extension 91 layer is 10-20m thick and the extension 92+3 layer is 30-40m thick. Taking the thickness of two small layers as the standard, the stratigraphic equal-thickness method can be used to directly divide the stratum with missing marker layers in the area.

3.1.4 Cyclic Correlation Method

Sedimentary cycles and lithologic assemblages are one of the common methods for stratigraphic division and correlation. The sedimentary characteristics of Yan9 formation in Baiyushan area have obvious sedimentary cycle in the longitudinal direction, which is a lithologic combination with sandstone at the bottom and mudstone at the top. The sandstone at the bottom of positive cycle is used as the dividing line for dividing small layers in stratigraphic division and correlation. There are two obvious sedimentary cycles in two small layers in the oil reservoir. It is necessary to consider the integrity of sedimentary cycles when using cycle correlation method to divide strata.

3.2 Stratigraphic Division and Correlation Results

On the basis of logging characteristics and under the constraint of marker layer, the fine stratigraphic correlation and division of more than 90 Wells in the study area were carried out by combining formation equal thickness method and cycle correlation method (FIG. 2). The Yan9 oil formation is divided into two sub-layers: Yan91 and Yan92 +3 from top to bottom. The analysis shows that the stratum thickness in this area is stable, the thickness of Yan9 layers is 50~60m, the small layers have obvious positive cycle law, and the sedimentary microfacies are mainly distributary channel.

Sai39-Tian188-ZJ87-Yang242-Tian153

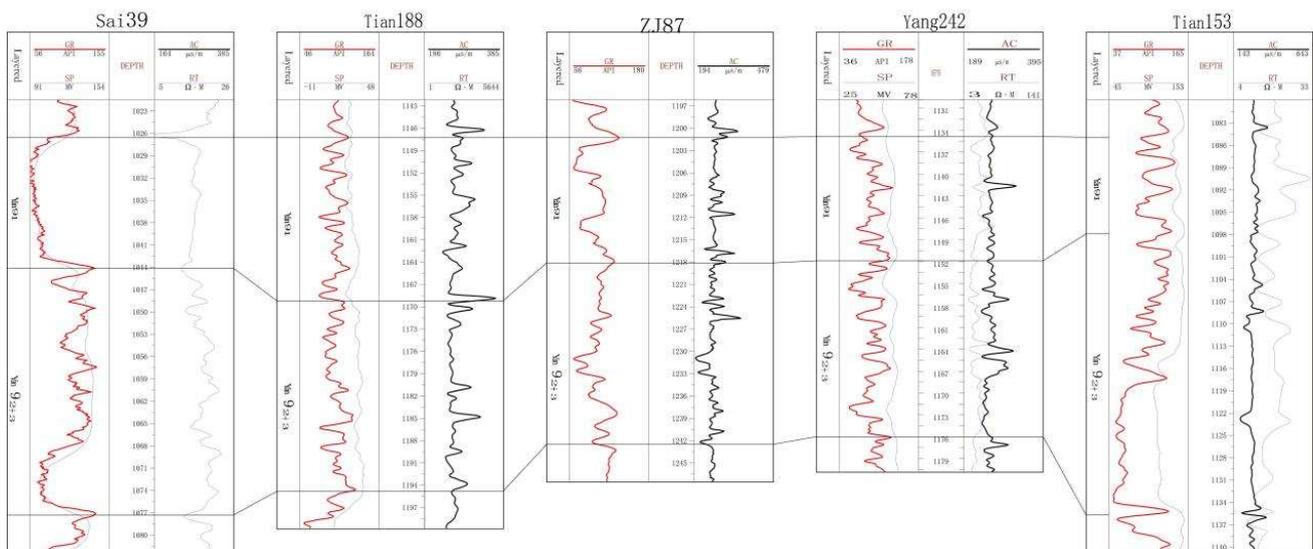


Figure 2. Stratigraphic division of Wells Sai39 and Tian153

4. Conclusion

Yan9 was divided into Yan91 and YAN92 +3 from top to bottom by using four methods, including marker layer method, logging curve characteristic method, formation equal thickness method and cycle correlation method. The stratigraphic distribution of Yan9 is stable, without stratigraphic discontinuity, and the stratigraphic thickness of each substratum is basically the same. The stratigraphic thickness of Yan92 +3 is relatively thick, 30-40m thick. The fine division and correlation of strata provide an important working basis for the study of the distribution law of sedimentary microfacies and sand bodies and the prediction of favorable areas.

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