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Combination of Well and Seismic Identification Technology with Low Sequence Fault

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Abstract: The low order faults lead the oil-water relationship of oil-bearing block reservoirs complicated, especially in those blocks that show poor continuity of single sand spatial distribution and obvious heterogeneity of sand internal structure. The recognition of low order faults plays an important role in finding favorable well location and solving injection contradictions. Based on a single anticlinal structure of Wei 21 Block in Weixing oil field, this article investigates and analyses the relative variation trend of Putaohua top location reflected in the well information of named well line by using the dense well pattern material of Putaohua reservoir group, and achieves the goal of low order fault recognition in this block effectively in conjunction with seismic profiles, so as to provide foundations in designing interspaced well project.

Keywords: low order fault; well log information; seismic profile; recognition.

ITRODUCTION

Low level faults means is derived from the high level faults, with Conventional geophysical methods (such as 3-D fine structural interpretation) difficult to identify small, microtomography it (such as the slip < 10 m, or the extended length < 100 m, disconnect the horizon less), It has a strong hidden [1, 2]. Currently, the ant tracking technology [3, 4], the seismic coherence techniques [5], the seismic attribute technology [6, 7], and other technical description of low level faults have been identified in the 3-D seismic block to find results, However, these techniques still require a higher quality of seismic data, For similar high level faults by seismic fault tracing can be closed and better results.

Satellite oil-field is located in the northern songliao basin of daqing changyuan in its construction to make the transition to Sanzhao sag slope, Target layer has been developed for the next section of Cretaceous Yaojia Putaohua oil [8]. Since no large area anticline formed only some of the fault block traps at fault, tectonic lesser extent. The area distributary channel sand-based, the single sand body plane connectivity is poor, Sifangtai deposited Depression period has begun oil generation in first-green of Sanzhao. Thus, from west was higher the east ancient tectonic pattern and make the area become a point of hydrocarbon migration zone. The block evaluating development since 1999, looking for a small local structural highs favorable position for oil and gas accumulation in the block become the main way to improve the reserves.

Satellite oil-field who the 21 blocks the current dense well data has reached 0.25 * 0.25km, for the analysis of changes in well constructed position to provide favorable conditions. In this paper, under dense well conditions, structural position with the Portuguese top row well logging data to reflect trends with varying depth, combined with seismic reflected in the form of low-level faults to identify and determine the fault location, has been drilling wells perforating data validation, adjusting the position of the fault, identify the effect of outstanding aspects of minor faults, the characterization of faults on the seismic section.

CHARACTERIZATION OF FAULT ON THE SEISMIC SECTION

On the seismic profile, the large-scale fault usually by observing the change of the seismic event in section features for identification: (1) the phase axis interruption;(2) the phase axis twist;(3) the quantity increase or decrease of phase axis;(4) change the width of the phase axis;(5) the phase axis strength reflection in transformation;(6) the phase axis bifurcate, merger, etc. When one or two of these characteristics in a very significant status exist, it can accurately judge the fault. And these fault broken strata is more, the spatial continuity is strong, the control region is bigger.

FAULT PERFORMANCE TRENDS EXIST IN THE SAME ROW OF PU WELLS POSITION ON THE TOP CONSTRUCTION

The 21 blocks is a typical thing to a single anticline structure in satellite oil-field. For the presence

of three or more wells from the same row of wells in the east to west, the structural high part of Pu's top position and structure of low parts of the wells of Pu's top location for inter-connection, if there is no fault, the two wells is won't appear obvious slope mutations. In contrast, the two Wells can present with one row of other well segment different slope, a mutation in Pu's top gap.

There are seven may exist low level faults wells. Interwell Pu's top position a chart as shown in figure 1 with the seismic section of well array through the contrast analysis and calculation. As can be seen from the figure, the slope of the line segments AB, BC, CD, DE, EF, FG, respectively, 0.0448, 0.1111, 0.0119, 0.0126, 0.0542, 0.0415, Seismic data and structure of the Pu's top drop data, it can be concluded at the point E on the left.

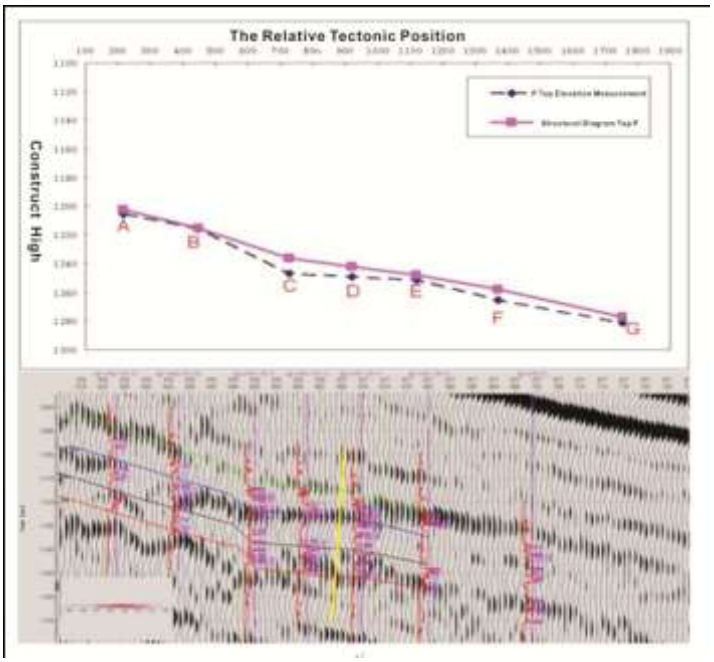

Fig. 1: 7 Wells of structure and corresponding position relatively well profile

EVALUATION OF THE PRACTICAL APPLICATION OF RESEARCH METHODS

Complete identification of low level faults by following these steps: (1) Useing Pu Top logging flag to read the same principle the different wells Pu's top construction location. (2) Draw the relative structural position and tectonic height cross plots, and calculated Pu's slope top construction between the positions of the connection section well. (3) It determines whether there is the slope of the line is significantly different from the other segments of the slope or the presence of a significant decline in upward lifting phenomenon. If there is, doing the next step; on the contrary, can judged no low level faults between as wells. (4) For the last steps to determine the position between the two Wells, combined with a detailed analysis of seismic body, and further confirms the existence of low level faults. (5) The use of low level faults recognition result, combined with the fluid properties provided by the well data to discrimination as a result, the actual deployment and perforation.

Use drop feature Pu's top construction location provided the well information to assist in identifying faults, it play an important role to study small faults. Figure 2 shows the method provided herein to identify low level faults in Wei 21 block. Where the fault identify explain the process of injection and production oilfield effect is not prominent, and the relationship between oil and water inversion phenomenon.

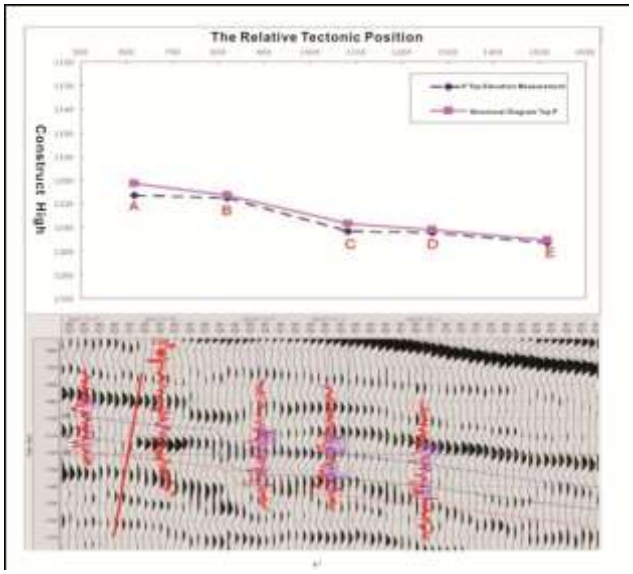

Fig. 2: The relative tectonic map and the corresponding cross-sectional view

Low level faults are shown in figure 2 to identify the fault. Fault well on the both side of Wei 2-1-37 and Wei 2-1-38. In the process of actual injection-production, 2-1-38 was pumping well, 2-1-37 was injection well, and two wells connected sand bodies to the same layer are perforation. But actual production data show that in six months later, 2-1-37 injection doubled, and 2-1-38 oil production i reduced from 6t/d to 2 t/d, the water injection development effect is not obvious. This explains the low level faults played a role in blocking to inject into the circulation of water.

CONCLUSION

In the quality of seismic data is difficult to achieve precision under the condition of low grade sequence fault recognition, it is a more effective and practical method With a relatively well data trends flag depth of dense well supplied, to Analysis of structural position to changes in the relative single block anticline fault. These methods not only reduce the uncertainty of seismic information recognition, but also practice is relatively simple.

Although this article is based on research carried out on a single block anticline, For relatively complex structure area, it can be identified by seismic data on the basis of block large tectonic background, the big blocks into a structure of a single small block, for each tiny blocks. It is an effective means of using methods provided herein Looking for low level faults, the site further determine has advantageous position of the development blocks.

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