

## **Research status of horizontal well logging interpretation in china**

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**Abstract:** - As the degree of global oil and gas exploration and development to continuously improve, China exploration and development has the good and virtue to thin reservoir, reservoir transformation, vertical well and deviated wells and interpretation method has been unable to meet the needs of oil production, in addition to the geological conditions (buildings, lakes etc.), applications also require high angle and horizontal well technology. Horizontal well technology in the development of new oilfields and the old oilfield effect is remarkable, it has the advantages of decreasing exploration cost, greatly improve the productivity of single well and the recovery rate of oil and gas. Through the massive literature investigation, study the current situation both at home and abroad, analyzed some present research methods of horizontal wells and the existing problems, and make a summary, and suggestions are given.

**Keywords:** - oil and gas exploration Horizontal well technology Logging interpretation research status

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### **I. INTRODUCTION**

In the early 80, In order to heavy oil production in a certain region of Italy karst strata, the operator to drill three wells, of which one vertical well and one inclined well is drilled oil layer 30m, and one horizontal wells through the reservoir 60m. With the drilling straight compared and deviated wells, horizontal wells this found very high. In order to get high yield from the cave and fracture distribution of oil or a few high yield evenly along the horizontal direction, logging operators there are ideas and pilot test, the world's first production logging in horizontal wells and horizontal well production logging technology, we developed<sup>[1,2]</sup>. As the application of horizontal well in thin and poor reservoir is very good, and the special geological environment building lake, must require the use of horizontal well technology, Horizontal well since twentieth Century 80 in the early 1990s has industrial application value in Europe after the birth, the horizontal well technology is quickly swept the oil drilling industry. Influence of horizontal well is in many aspects, but also more and more accepted by the people, the future for the type of drilling, most will be horizontal well<sup>[3]</sup>.

### **II. RESEARCH SITUATION OF HORIZONTAL WELL LOGGING INTERPRETATION IN CHINA**

China is one of the research and the national technology using horizontal well the earliest, China in twentieth Century 60 time metaphase, in the southwest played two port test of horizontal wells and horizontal well technology, real time starting in 1990, in the next two years, have played 14 horizontal wells, to 2003, China end of horizontal well drilling to reach 130, the development of horizontal well technology at home soon, but the difficulty of horizontal well logging interpretation technology has made great improvement, technology also has the certain break through. The main horizontal well distributed in Xinjiang, Daqing, Liaohe, Jidong, Sichuan, Tarim, Jilin, Shengli Oilfield, over the years, summed up the

experience of many precious logging interpretation. In 1993 the J.M.singer iterative simulation method on the level of induction logging are facing layer correction, are also calculated from the borehole to the nearest layer interface distance. In 2004, Zhao Jun analyzes the technology of horizontal well logging interpretation of relationship between well trajectory and reservoir. In 2006 ZhangYanhong for horizontal wells in thin layer identification methods to do the research, is mainly from the angle of logging response characteristics of horizontal and vertical wells to consider, and first proposed the method to determine the lithology interface with microsphere focused resistivity logging combined with gamma ray. In 2008 van just analyzed the difference of horizontal and vertical wells in logging environment, log response, and the level of logging in natural sites, natural gamma, acoustic logging response characteristics on layer interface, the horizontal well logging interpretation is also discussed. But compared with foreign horizontal wells and well logging interpretation, there is still a gap.

First, in the acquisition and logging information, behind a lot of<sup>[4]</sup>;

Secondly, the application of conventional interpretation method for vertical well in the horizontal wells need to be systematic, reasonable;

Finally, the horizontal well mapping system, also need to continuously improve.

In log interpretation software development, Shengli Oilfield horizontal well trajectory software HWAS<sup>[5]</sup>, In the introduction of foreign advanced technology and innovation, the technology has matured, the software can give the horizontal well trajectory plane projection map, profile projection and display the actual trajectory along the borehole shape of the interpretation results, But it is not a vertical wells and explain the different things in the interpretation model, response equation and so on, can say or straight well when explaining the old way. All the aspects of the research work are also generally at the level of<sup>[6]</sup>.

### **III. BASIC RESEARCH**

#### **A horizontal well logging data processing**

The intuitive graphical display is very important to the horizontal well logging interpretation, one side need to determine the bottom hole and horizontal displacement according to well trajectory, on the other hand is in contrast to work well. Drawing hole trajectory needs well diameter, azimuth, inclination data, to calculate the every point of the vertical depth, well trajectory on the thing and North and South displacement, followed by a series of coordinate operations, combined with two-dimensional and three-dimensional display of the well trajectory, the trajectory and space range<sup>[7,8]</sup> to react well.

#### **B Research on anisotropy**

Anisotropy is mainly focused on the research of anisotropic rock anisotropy measurements and logging data correction<sup>[9]</sup>. The anisotropy of anisotropic correction by electrical and acoustic characteristics of the formation to solve curve deviated wells. This method by understanding the electrical and acoustic characteristics in parallel to the surface layers of physical response and the response of the vertical to the ground layer physical layer, trying to solve any angle correction under the influence. For example, when the current is parallel to the layer plane flow, small resistance, so the transverse resistivity less; when the current is perpendicular to the ground surface layers of physical flow, resistance is large, so the larger longitudinal resistivity, the difference uses the anisotropic efficient  $=R_n / R_t$  to reflect (among them,  $R_n$  is the longitudinal resistivity,  $R_t$  is the lateral resistivity) to express. The biggest advantage of this correction method<sup>[10]</sup> is that it can be transformed into a kind of iterative algorithm, is very suitable for point by point explanation.

#### **IV. OTHERS**

Horizontal well technology can effectively improve the oil and gas exploration, in recent years, in order to better interpret the horizontal well, China has made a lot of efforts, including research center laboratory, as well as some other institutional, dedicated to the study of horizontal well technology. China also strongly support the research of the log interpretation of horizontal well. Some project have been project, 973,863 research projects and innovative projects both have the log interpretation of horizontal well project. Many research institutions including the enterprise, University and other researchers doing their best to study horizontal well technology.

#### **V. DIFFICULTIES IN LOG INTERPRETATION OF HORIZONTAL WELL AND SHOULD PAY ATTENTION TO THE PROBLEM**

A Horizontal well logging interpretation difficult and critical study is to figure out the differences between the instrument response in highly deviated wells and horizontal wells and vertical wells. This needs for well model simulation experiments to solve.

B The theoretical model calculation by computer, at present has completed all the analytical solution can be obtained for the boundary value problems, especially the complicated problem for determining solution, Except for three dimensional finite element method completely pass, can be made breakthrough progress. In other words, the computer simulation research in the field has entered the "bottleneck".

C There is a gap between the theoretical research and practical production in horizontal wells, Often in the laboratory that the theoretical data and the conclusion can not very well with the actual production matching, the experimental data are iterative analysis, and constantly revised to achieve consistent with the actual results.

#### **VI. CONCLUSION**

A The biggest difficulties in log interpretation of horizontal well is the conventional straight well logging interpretation method is not suitable for highly deviated wells and horizontal wells, it must pay attention to the interpretation method for application of vertical well of horizontal well.

B If you want in the interpretation of horizontal well technology breakthroughs, Must simulate the progress the research field in computer.

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