Production Reserves Estimation Technology and Research Method Based on Computer Aided Technology

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Abstract. With the development of oil exploitation, the technology of oil exploitation is becoming more and more perfect. Affected by the imbalance of storage and production, oilfield production capacity is in a floating state. Due to the relatively few unexplored resources, the sustainable development of oil fields is limited to some extent. Therefore, it is an important way to effectively reduce the risk and improve the development efficiency to evaluate and analyze the unused reserves and select the appropriate development method. The development of computer aided technology is expected to improve this shortcoming. Taking the undeveloped reserves of an oil field as an example, this paper USES computer aided technology to select the corresponding parameter sequencing method and analyze the exploitation potential of each layer block, so as to facilitate targeted research and formulation of plans and lay a solid foundation for improving the comprehensive development benefits.

Keywords: unused reserves; computer aided technology, evaluation technology; potential analysis

1. Research on evaluation technology and method

The so-called unused reserves of oil fields mainly refer to the reserves that have been identified through prior technical exploration, such as the number, distribution and scale of reserves, but have not been substantially developed due to the lack of cost or technical conditions. This paper takes an oilfield as the research object and makes a specific analysis. Through exploration, it is found that about 30% of the reserves have not been exploited and are still distributed in different layers on the surface of the oilfield in various states. With the continuous development of domestic oilfield survey technology, the depth and breadth of the survey have changed greatly. A large number of volcanic rock and lithologic reservoirs have been found. With the continuous increase of reservoir volume, the application of technical means is becoming more and more complex. However, from the perspective of actual effect, the newly proved oil field is of low grade, high technical requirements and low comprehensive benefit.
From this point of view, to strengthen the evaluation and use of unused reserves is an important method to ensure the stability of crude oil production.

1.1. Research object

Based on the research results of Zhang Daiyan, the subject divides the reservoir into three major categories and 17 subcategories according to the special rock, sandstone and conglomerate, and adopts the method of sorting and screening to comprehensively evaluate the unused reserves. According to the above classification, the undeveloped reserves of the modified oil field can be divided into 57, with the reserves reaching $20055.71 \times 10^4$. After removing 2 layers that have been used and 2 layers with limited conditions and 3 secondary evaluation, it is determined that the reserves are to be determined. Finally, 50 undeveloped oil fields (including 22 conglomerates, 25 sandstone reservoirs and 3 special rock reservoirs) are analyzed and evaluated.

1.2 Evaluation method

From the analysis of practical results, there are many methods of ranking evaluation, such as grey clustering method, Monte Carlo method, analytic hierarchy process, etc., but from the applicability point of view, none of them is applicable to the analysis of the unused reserves of the field. In order to improve the pertinence and effectiveness of the research, the "line proportion" analysis method is designed, that is, the basic evaluation value of a factor is equal to the number of lines it occupies in the studied sequence curve. This method is original by Zhang Daiyan and so on. It has good applicability and pertinence.

Application process of line proportion analysis method. Output statistics of American oil fields refer to figure 1.

![Figure 1. Output statistics of American oil fields](image)

1.3 Determine index weight

According to the characteristics of the research object, the index set is constructed by combining reserve abundance, productivity, permeability, crude oil viscosity and reserve scale. Although there are many methods to determine the index weight, this paper chooses the direct method to study the potential of different blocks.
1.4 Method validation

According to the above method, some blocks that have been used are selected for comprehensive ranking. According to the ranking results, the blocks with high potential evaluation value are obtained, and the development effect is relatively good\(^\text{[4]}\). It shows that the potential value is closely related to the development degree, and the index and weight distribution method are reasonable.

1.5 Evaluation results

Through the above calculation method, the comprehensive evaluation of conglomerate, sandstone and special rock reservoirs in the reserve block distribution is carried out. From the calculation results, if the evaluation value is relatively high, the greater the potential for development, otherwise, the smaller. From the evaluation results, most of the three types of condensate reservoirs are class 1, and there is no significant rule between the evaluation value and development classification.

2. Study the proposed reserve production plan

Implement the safety production policies, laws and regulations, strengthen team construction, and comprehensively implement the safety production management; formulate and implement safety production responsibility system, safety management system, safety operation procedures, safety measures, assessment standards, reward and punishment methods, etc., and conduct regular inspection and assessment; Reserves of unused oil fields refer to figure 2.

![Reserves](image)

**Figure 2.** Reserves of unused oil fields

2.1 Basic principles

Before the development of production plan, it is necessary to sort and screen the reserve blocks according to different reservoir potentials, and remove the blocks with data less than 0.5 and to be developed or occupied in the whole data system\(^\text{[5]}\). According to the principle of giving priority to economic reserves, test blocks and risk advantages, blocks with high reserve abundance, large scale, high production capacity, shallow burial and good physical properties of crude oil shall be selected for exploitation.
2.2 preparation plan

According to the above principles, 13 undeveloped blocks are selected as the follow-up development areas, with an area covered reserves of $5781.89 \times 10^4 t$, including 5 blocks in 2016, with an estimated reserves of $4016.22 \times 10^4 t$; 4 blocks in 2017, with an estimated reserves of $894.21 \times 10^4 t$; 5 blocks in 2018, with an estimated reserves of $1793.25 \times 10^4 t$. At present, the five blocks to be used in 2016 have begun to enter the preparation stage.

3 Conclusion

To sum up, the field is rich in undeveloped reserves, which is of great significance for maintaining the stability and balance of production capacity. The "line proportion" multi parameter sequencing analysis method is used for reference to improve the research effect on the undeveloped reserves. The evaluation method is used to study the potential of the undeveloped reserves by lithology, so as to reflect the classification results of benefit evaluation and provide enough for subsequent development basis[6].

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