# Original Research Article

# Trap evaluation technology and its application

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*Abstract:* Traps are extremely important geological structures in oil and gas exploration, and trap evaluation techniques are crucial for accurately assessing the potential of oil and gas resources and guiding exploration and development work. This article elaborates on the main content of trap evaluation technology, including the geological characteristics, reservoir characteristics, fluid properties, as well as the types and distribution of traps. By analyzing the application cases of trap evaluation technology under different geological conditions, demonstrate its effectiveness and importance in practical exploration work. Simultaneously exploring the development trend of this technology in the field of oil and gas exploration, providing reference for further improving the efficiency and development level of oil and gas exploration.

Keywords: Trap evaluation technology; Oil and gas exploration; Geological structure; Reservoir characteristics

# 1. Introduction

As an important location for oil and gas accumulation, the evaluation technology of traps is crucial for oil and gas exploration work. The development and application of trap evaluation technology can help geologists better understand the formation mechanism and distribution rules of oil and gas reservoirs, thereby improving the success rate and economic benefits of oil and gas exploration.

# 2. The main content of trap evaluation technology

## 2.1. Geological characteristics of traps

The geological features of traps are rich and diverse, and their structural types cover various forms such as anticlines, faults, and lithological traps. The forms of geological structures vary greatly, ranging from gentle folds to complex shapes formed by fractures. In terms of scale, from small folds in local areas to large structures that extend thousands of meters or even more widely. The contact relationship between strata is also crucial, as the overlapping and displacement of different strata have a significant impact on the formation of traps and the accumulation of oil and gas. For example, the anticline structure is like a natural arch structure, forming a good storage space at its top and wings, which can effectively gather oil and gas and provide favorable conditions for oil and gas storage and enrichment.

#### 2.2. Reservoir characteristics

Reservoir characteristics are key elements in trap evaluation. The rock types of reservoirs are diverse, including sandstone, shale, limestone, etc. There are significant differences in storage space size and performance among different rock types. For example, sandstone has larger intergranular pores that can accommodate more oil and gas, while shale has smaller and mostly micro pores, resulting in relatively weaker storage performance.

Porosity is an important indicator for measuring the storage capacity of a reservoir, which determines how much oil and gas the reservoir can store. High porosity means that the reservoir has more space to accommodate oil and gas. Permeability plays a crucial role in the migration of oil and gas, as reservoirs with high permeability allow for smoother flow of oil and gas.

In addition, the heterogeneity of the reservoir cannot be ignored. Heterogeneity is reflected in the structure, composition, pore distribution, and other aspects of rocks, which can lead to different storage and permeability capabilities of reservoirs in different parts. For example, in some reservoirs, local high permeability zones may facilitate rapid migration of oil and gas, while low-permeability areas may hinder the flow of oil and gas, affecting the overall evaluation of the trap.

### 2.3. Fluid properties

The fluid properties within the trap are diverse and significant for oil and gas extraction and processing. The composition of oil and gas is complex, containing various hydrocarbons and other impurities, and the ratio of different components determines the characteristics of oil and gas.

Density is an important indicator for measuring the quality of oil and gas. Different densities result in different distributions and flow states in the reservoir. For example, high-density oil and gas tend to sink more in reservoirs, which may affect production during extraction. And viscosity affects the flow ability of oil and gas. Oil and gas with high viscosity have greater flow resistance and require more energy consumption during extraction and transportation.

In addition, other properties of oil and gas, such as wax content and solidification point, can also affect extraction and processing. For example, oil and gas with high wax content are prone to crystallization and blockage of pipelines at low temperatures, which poses difficulties for extraction and transportation. The combination of these fluid properties determines the method, efficiency, and subsequent processing of oil and gas extraction. Therefore, accurate analysis of fluid properties is crucial in trap evaluation.

### 2.4. Types and distribution of traps

There are various types of traps, mainly divided into structural traps, lithological traps, and stratigraphic traps based on geological characteristics and formation mechanisms. Structural traps are traps generated by folds, faults, and other structures formed by crustal movement, commonly including anticlinal traps and fault traps. Lithological traps are traps formed due to differences in rock lithology, such as lithological spikes, lenses, etc. Stratigraphic traps are traps caused by factors such as geological unconformities and lithological changes.

The distribution of traps is closely related to geological structures and stratigraphic changes. In areas with active plate movement, large structural traps are often formed; In sedimentary basins, lithological and stratigraphic traps are more common. Different types of traps exhibit unique distribution characteristics in different regions. For example, in the eastern region of China, due to frequent tectonic activity, structural traps are more common; In some basins in the west, lithological and stratigraphic traps are widely distributed. The distribution characteristics of these traps provide important basis for oil and gas exploration.

## 3. The development trend of trap evaluation technology

#### 3.1. Multidisciplinary comprehensive evaluation

In the field of oil and gas exploration, the interdisciplinary comprehensive application of trap evaluation is becoming increasingly crucial. Based on the discipline of geology, the basic geological characteristics of traps, such as structural morphology and stratigraphic distribution, are determined through the study of rocks and strata. Geophysics utilizes various technological means, such as seismic exploration, gravity exploration, etc., to detect the underground geological structure and spatial distribution of traps, providing important information for trap evaluation. Chemistry plays an important role in analyzing the composition of oil and gas, fluid properties, and other aspects, which helps to gain a deeper understanding of the characteristics of oil and gas in traps.

Interdisciplinary integration enables comprehensive evaluation of traps from different perspectives. For example, the combination of geology and geophysics can more accurately determine the location and scale of traps; Combining chemistry with geology and geophysics can better analyze the properties and variation patterns of fluids within traps. This multidisciplinary comprehensive evaluation method can improve the accuracy and reliability of trap evaluation, providing more scientific and comprehensive guidance for oil and gas exploration.

### 3.2. Advanced exploration techniques

In the field of oil and gas exploration, advanced exploration technologies are constantly innovating. Three dimensional seismic exploration technology can accurately depict the structural morphology, stratigraphic distribution, and geological characteristics of traps, as well as faults, by collecting seismic data in the underground three-dimensional space. High resolution imaging technology further enhances the ability to capture trap details, allowing us to observe the structure and characteristics of reservoirs more clearly.

In addition, computer simulation technology plays an important role in trap evaluation. It can simulate the formation process of traps and the migration and accumulation of oil and gas based on geological data and relevant parameters. Through simulation, we can gain a deeper understanding of the evolution patterns of traps under different geological conditions, providing a more scientific and comprehensive basis for trap evaluation. The application of these advanced technologies not only improves the efficiency and accuracy of trap exploration, but also brings new breakthroughs and developments to oil and gas exploration work, helping geologists to more accurately evaluate the potential and value of traps.

#### 3.3. Improve the accuracy and efficiency of trap evaluation

The improvement of accuracy and efficiency in trap evaluation is the key to oil and gas exploration work. In practical operation, optimizing the trap evaluation process and methods is crucial. For example, the processing and analysis of exploration data has shifted from traditional manual analysis to automated and intelligent processing methods, which can quickly screen trap related information and reduce human errors.

In terms of improving the accuracy of trap evaluation, advanced geological modeling techniques are utilized to accurately simulate the geological characteristics and reservoir parameters of traps. Through multidimensional analysis, comprehensively understand the internal structure and potential risks of the trap.

In order to improve efficiency and strengthen the research and development of trap evaluation technology. On the one hand, developing new exploration equipment and software to enhance data collection and processing capabilities; On the other hand, establish a comprehensive trap evaluation system, standardize evaluation standards and processes.

Through these measures, trap evaluation work can be carried out more efficiently, providing more reliable technical support for oil and gas exploration.

### 4. Conclusion

The trap evaluation technology has irreplaceable value in the field of oil and gas exploration. Through in-

depth research and comprehensive evaluation of the geological characteristics, reservoir features, fluid properties, trap types and distribution of traps, solid scientific basis can be provided for oil and gas exploration work. With the continuous advancement of technology, trap evaluation technology plays an increasingly crucial role in the exploration process, not only helping to improve exploration efficiency, but also effectively reducing exploration risks. In the future, the development of trap evaluation technology will bring more opportunities and challenges to oil and gas exploration work, promoting the entire industry to move towards a more efficient and accurate direction.

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