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Research on the development of innovative petroleum geological exploration technology

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Abstract. Petroleum resources are of great significance to the development of China's economy. The petroleum geological exploration technology has undergone a long development, and the application of exploration technology has made great progress. With the continuous increase of mining intensity, the exploitation depth of oil is increasing and the difficulty coefficient is increasing, which poses more difficult challenges for petroleum geological exploration work. Therefore, the development of innovative petroleum geological exploration technology has very important strategic significance, which determines the future development direction of China's petroleum industry. This paper will introduce China's existing petroleum geological exploration technology, and introduce the direction of oil exploration technology development, and at the same time formulate relevant development strategies.

Key words: Innovation, petroleum geological exploration, technological development, research.

1. Introduction

Innovative petroleum geological exploration technology can effectively improve the efficiency of oil exploitation and is the technical guarantee for the long-term development of the petroleum industry. With the continuous development of the economy, China's demand for oil is increasing, and petroleum resources have an irreplaceable role in the development of many industries. This is also an important reason for the steady development of the petroleum industry in recent years.

2. The significance of the development of innovative petroleum geological exploration technology

The petroleum industry is a key development industry in China. As the difficulty of mining increases, the requirements for exploration technology are also constantly improving. In this industry, the quality of oil exploitation has always been a matter of concern, and the important factor affecting the quality of petroleum is geological exploration technology [1]. At present, petroleum geological exploration technology has fully utilized computer technology, simulation technology, etc., and the exploration efficiency and exploration quality have also been improved to some extent. The expansion casing technology has also reduced the cost of petroleum exploration to some extent. It can be seen that the addition of high-tech technology to petroleum exploration technology can increase the output of oil



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exploration and improve the comprehensive strength of exploration technology. From a long-term perspective, innovative oil exploration technologies are conducive to safeguarding China's energy security and promoting social and economic development.

3. China's existing petroleum geological exploration technology

Innovative oil exploration technology should be carried out on the basis of fully researching existing technologies. With the continuous development of science and technology in China, many advanced technologies have been applied to the petroleum exploration industry, and the degree of intelligence in petroleum exploration is constantly improving.

3.1. Geological exploration logging technology

In the petroleum geological exploration work, the logging technology is more to use the numerically controlled logging tool to complete the measurement work. This method is applied for a long time, and the worker's operation technology is relatively mature. However, the traditional numerical control logging tool itself has some drawbacks. In the process of actual application, it will lead to some inaccurate measurement and reduce the application degree of measurement data. With the continuous development of the information age, more advanced computer technology should be applied in logging technology. The numerically controlled logging tool should also be replaced by some more advanced instruments to improve the accuracy of measurement parameters. At present, some oil companies have gradually applied some imaging function instruments and sensors in technology research and development. These instruments have realized the visualization of the exploration process, effectively improved the understanding of the staff's downhole conditions, and facilitated the further development of exploration work. As shown in Figure 1, it is a simulation map of geological exploration logging technology.

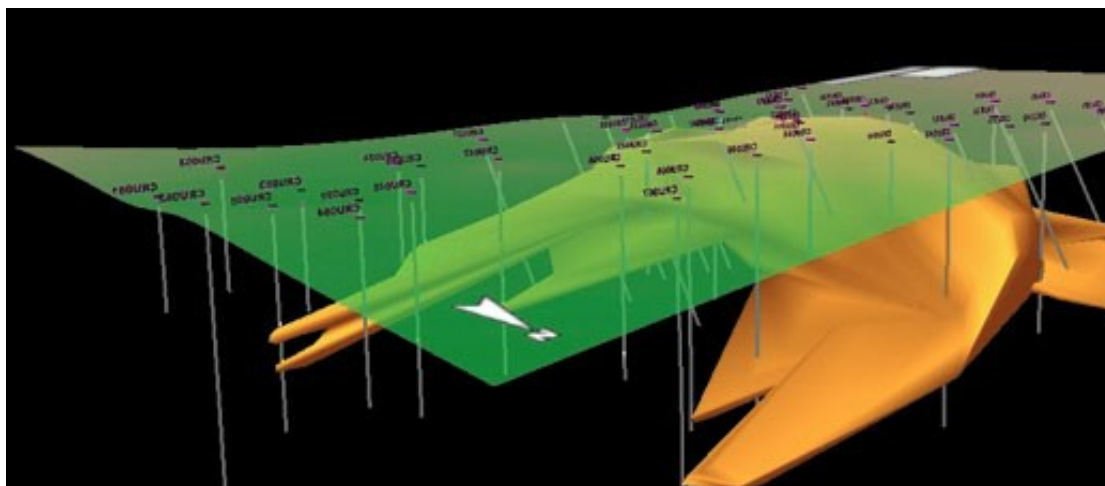


Figure 1. Geological exploration logging technology simulation map.

3.2. Geological exploration drilling technology

Drilling technology has always been in a very important position in geological exploration work, but the cost of drilling technology in oil development is very large, and there are still many operational difficulties, such as the danger and corrosiveness of drilling, which need to rely on advanced Technology to overcome one by one. Through the continuous efforts of some petroleum companies' technical research departments, large displacement drilling technology is gradually applied to drilling work, which improves drilling efficiency and reduces drilling risks. As shown in Figure 2, geological exploration drilling techniques are demonstrated [2].

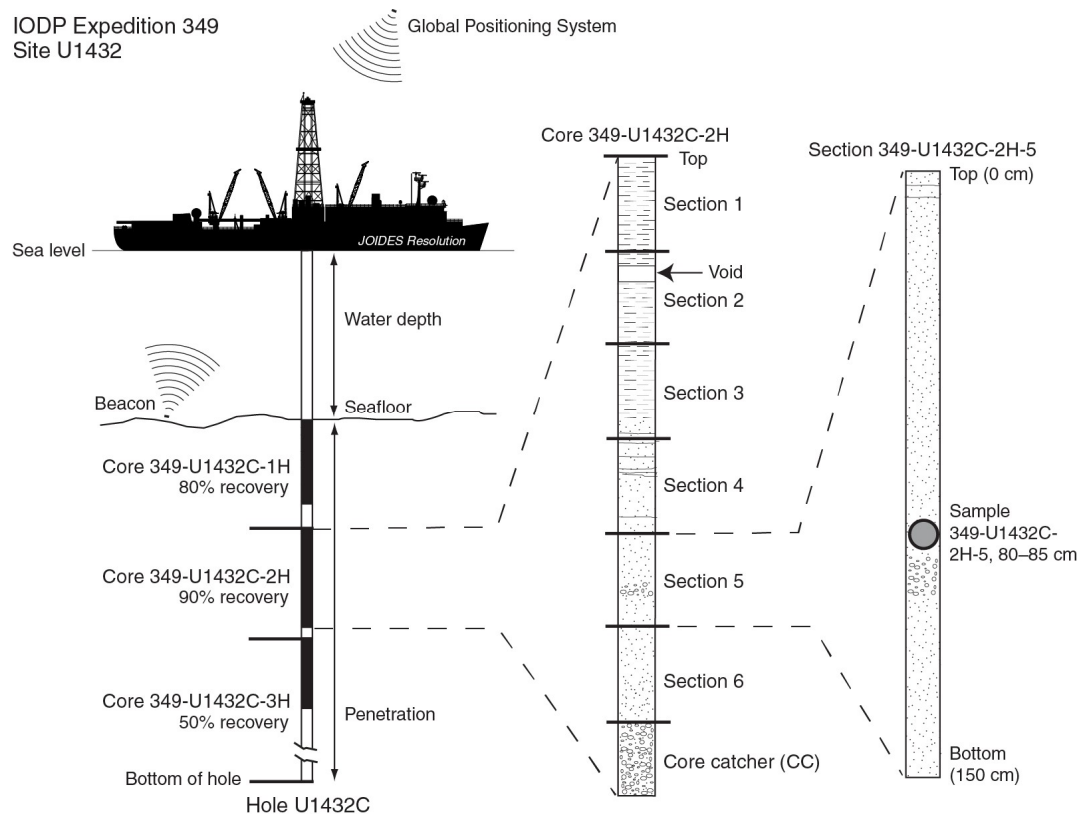


Figure 2. Geological exploration drilling technology.

3.3. Geological exploration geophysical technology

Geophysical exploration technology is currently the key target for petroleum companies, and it is also a very important link in the geological exploration process. It plays an important role in the entire oil exploration process. The specific implementation principle of geophysical technology is to detect the stratigraphic structure inside the development area, to understand its geological structure, and to detect whether there is a reservoir in the underground. At present, the more common geophysical techniques include reflective seismic technology and 3D seismic technology. Many new technologies have a certain role in geophysical technology, such as visual drilling technology, which can fully present the drilling process and promote the completion of drilling work. As shown in Figure 3, the geological exploration geophysical technology model is presented.

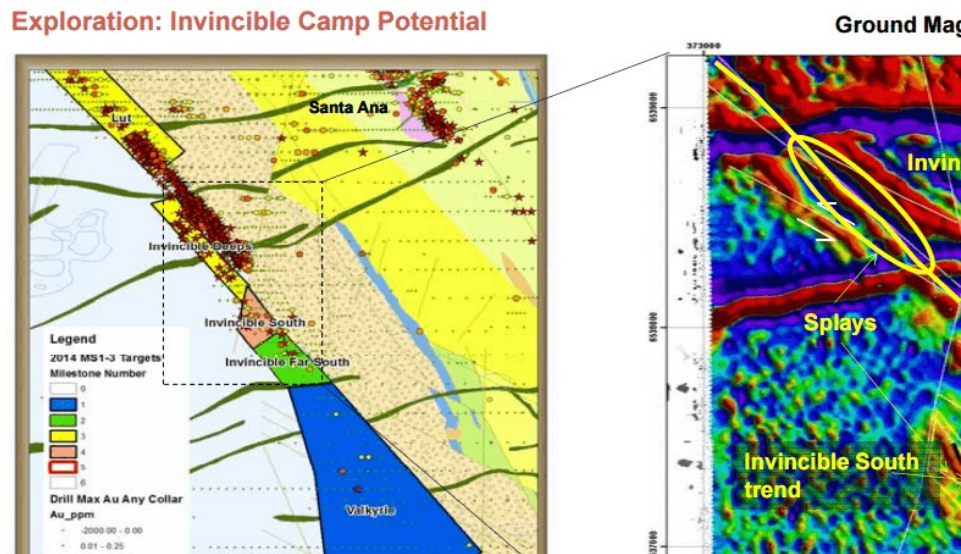


Figure 3. Geological exploration geophysical technology model.

4. The development direction of innovative petroleum geological exploration technology

China's petroleum resources have always been in a very important strategic position. The issues related to oil exploitation are also the focus of relevant scholars' research. The oil problem is mainly divided into two aspects, one is the exploitation of petroleum resources, and the other is the petroleum resources. Guarantee. Oil exploration technology is related to the quality of petroleum resources and to the later use of petroleum. Under the current situation, only by continuously increasing the innovation of oil exploration technology can we ensure the exploration efficiency of petroleum resources and improve the precision of exploration, thus promoting the long-term development of the petroleum industry.

4.1. Promote the diversification of oil exploration technology

Most of China's oil exploitation areas have complex geological environments. The exploration of petroleum geology is actually quite difficult. Due to technical defects in oil exploration, the petroleum industry has been subject to development constraints [3]. Therefore, oil companies should promote the diversified development of oil exploration technology, comprehensively improve the level of geological exploration, and combine geological exploration with two-dimensional technology and four-dimensional technology.

4.2. Improve the scientific and technological content of petroleum exploration technology

Scientific and technological innovation is the fundamental support for the improvement of petroleum exploration technology. At present, computer technology is booming and plays an increasingly important role in oil exploration and oil exploration. This fully proves the correctness of the application of computer technology in petroleum exploration technology. Computer technology can simulate the oil exploration process, can effectively simulate earthquake and underground petroleum structures, and simulate terrain and improve the quality of oil exploration.

4.3. Improve information decision evaluation system

The information decision-making evaluation system is a must for oil companies. Through the information decision-making evaluation system, enterprises can combine the exploration target value and comprehensive resource evaluation technology to ultimately improve the competitiveness of enterprises and enable enterprises to occupy the front end of the industry. China is a big country with large oil demand. The market faced by enterprises is complex and changeable. The application of

information decision-making evaluation system is conducive to improving the stability of economic development. Enterprises can also quickly understand the market and maintain market stability.

5. Development strategy of innovative petroleum geological exploration technology

5.1. Innovative development of logging technology

With the continuous improvement of science and technology, many advanced scientific and technological achievements have been applied in logging technology, and the application to computers has become more and more extensive. Logging technology requires a large amount of electronic equipment to be used to improve the accuracy of logging data. In the data processing process, technicians are continually optimizing data processing programs and using better-performing machines to effectively improve data processing.

5.2. Innovative development of drilling technology

The oil drilling process requires high cost and is the costliest in the entire geological exploration work. Therefore, vigorous development of drilling technology can effectively reduce the mining cost. Among the traditional drilling techniques, underbalanced drilling technology is relatively common. This technology has a relatively fast speed in the drilling process, and it also has a good mining effect in the depleted layer. However, underbalanced drilling technology also has its own drawbacks [4]. For example, the operation process is complicated and requires many other equipment to support the drilling work. Therefore, the drilling work cannot rely solely on underbalanced drilling technology, and it also needs to carry out three-dimensional drilling technology, ultra-deep drilling technology, multi-branch drilling technology, and visual drilling technology.

5.3. Innovative development of geophysical technology

Geological exploration technology is the core of the development of the petroleum industry. Geophysical exploration technology, as an important exploration technology, is an important part of geological exploration. The innovative development of geophysical technology is concentrated in the data collection. By analyzing the geological environment of the tested area, a large amount of survey data can be obtained first, and then the processing of these data is a very critical step. The processing of data should make full use of computer technology to promote the efficiency of geological exploration. At present, the pre-stack depth migration technology has been applied in geophysical technology, in addition to the thinking seismic monitoring technology, the application of these technologies is conducive to the continuous improvement of geophysical technology and improve the quality of analysts' analytical data. Geophysical technology is still in the process of continuous development, and more advanced technologies will be added, such as visualization technology. As shown in Figure 4, the pre-stack depth migration technique is shown.

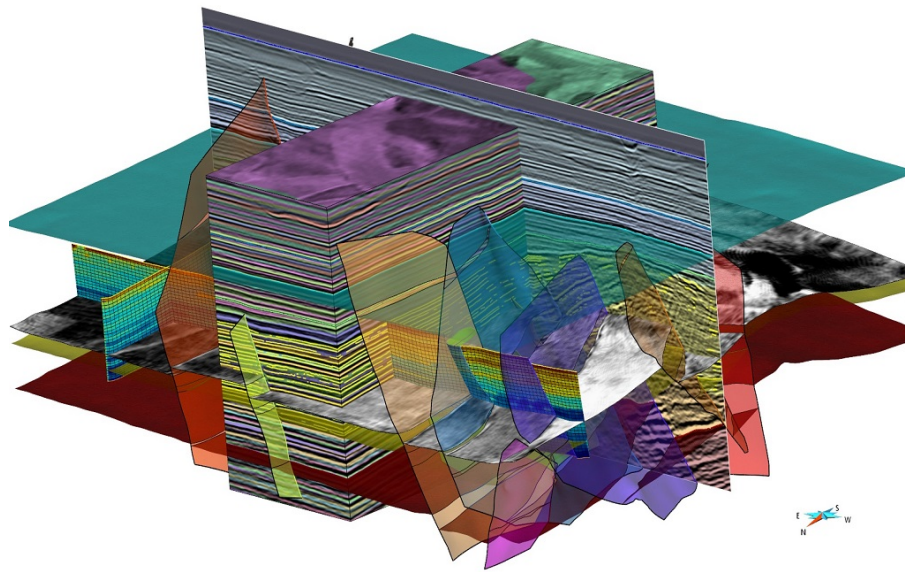


Figure 4. Pre-stack depth migration technique.

6. Conclusion

Oil is an important resource for China's economic development. The exploitation of oil is a matter of great research in many countries. As the demand for petroleum resources continues to increase, the pressure on oil companies is increasing. Therefore, we must innovate oil exploration technology, optimize the oil extraction process, ensure the quality of oil exploration, and meet the society's demand for petroleum resources.

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