Application Research of Big Data Analysis Technology in Oil and Gas Field Development

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Abstract. The goal of oil and gas field development is to maximize the benefits of exploitation work. In some large oilfields entering the mid-to-late development stage, to maximize the input-output ratio of oilfield exploitation, in oilfield development work, you will receive. Due to the influence of many interference factors, in the field of oilfield exploitation, it is necessary to reduce the economic cost of oil and gas field exploitation as much as possible and continuously improve the economic benefits of oilfield mining units. In the mid-to-late production of oil and gas fields, the use of big data to establish a reasonable and scientific production plan for oil fields and an effective decision support system provide an important guarantee for the development and production of oil and gas fields in the middle and late stages. Through the use of effective production-increasing technology and production decision-making, comprehensively consider some oilfield mining areas and newly-added resource mining areas, comprehensively optimize and set up the development of oilfield resources in the middle and late stages and use big data technology to develop oilfields. Among them, the resource advantages are effectively transformed into economic advantages, in order to provide a good work plan for the middle and late stages of oilfield development.

Keywords: Big Data, Analysis, Oil and Gas Fields

1. Introduction

The distribution of oil and gas fields in China is relatively wide and they are almost distributed from the Cenozoic to the Paleozoic. To effectively improve the overall function of oil and gas field development and create better working conditions for the development of oil and gas resources, it is necessary to use big data to effectively increase production and then integrate it into actual work. However, there are certain defects and deficiencies in many professional technical fields. In the actual oilfield mining work, it is necessary to select the best miner's technology according to the actual
conditions of the miners on the site and then use big data through tentative use to continuously optimize the production technology of oilfield mining, so as to lay an important guarantee for the improvement of the efficiency and quality of the entire oilfield mining work[1].

2. Overview of big data analysis technology

In the network environment, the information management of enterprise files has become a new development direction of file management. On the Internet, archive information is effectively classified, such as some big data information obtained from professional websites, forums and related blogs and it has gradually become a new model for utilization. In response to this model, some developed countries have made early attempts and achieved remarkable results. The digital archives applied in our country are service systems oriented by users' needs. Based on the analysis of this big data platform, the in-depth mining of archive information and data makes the various elements of archive information management form intrinsic. The connection between the two has fully realized the sharing of archive information resources and met the user's needs for archive information, so as to improve the efficiency of enterprise archive information management.

The adjustment of big data information includes the following items: First, the amount of information collected by big data information is huge, which also puts forward more stringent requirements for traditional data information systems. Traditional data analysis software has been unable to effectively adapt to big data information. Compared with the amount of data, the demand for development has shown a low density. Secondly, different sources of data information are different, such as the visitor's visit records, visitor logs and social media data. At the same time, the types of data are also different. The traditional data structure types are divided into structured and unstructured. The former is oriented to the data in the database and the latter contains text, documents, pictures, and some video information. Finally, the formation of big data requires the system to provide real-time data analysis results according to the needs of users and users can effectively predict what will happen next through the analysis of these data[2]. The purpose of big data is shown in the figure below.

![Figure 1. Purpose of big data](image)

3. Development technology of oil and gas fields
3.1. Fracturing technology

In the middle and later stages of oil and gas field development, the total amount of oilfield production can be increased through fracturing technology[3]. In the process of using fracturing technology, it is necessary to cooperate with the pressure fluid. During the operation process, it is necessary to inject the corresponding working pressure inside the oil and gas well to ensure that the oil and gas assumes a completely cracked state. On this basis, by supporting the liquid, the crack state is effectively fixed to ensure the flow performance of the entire oil city and provide good working conditions for subsequent mining work. Through the effective application of fracturing technology, the flow rate of the entire oil recovery layer can be greatly improved and the efficiency and quality of oil extraction in the middle and late stages can be improved, thereby achieving the effect of the entire oil resource extraction. The growth of oil and gas field output is shown in the figure below.

![Figure 2. Growth of oil and gas field](image)

3.2. Acidification technical measures

The chemical dissolution of acid solution is mainly used to fully dissolve the cement in the oil layer rock, so as to continuously increase the size of the pore volume in the rock layer, thereby improving the state of the rock pores and oil flow. Through the technical measures of both parties, the acidification degree of the matrix can be effectively improved and the effective application of the acidification technology by pickling or fracturing has a very obvious effect on the acidification of petroleum resources[4]. In the actual operation process, the acid layer is injected into the oil layer after the fracturing is completed and then the dissolution of the fracture is continued to ensure that the rock permeability of the entire oil layer is increased and the fluidity of the fluid in the downhole oil layer is continuously improved. It improves the work flow performance of oil and gas fields after oil and gas enters the well, effectively alleviates the resistance generated by oil resources during the flow process and then reaches the work goal of oil resource production.

3.3. Technical measures for water plugging

In the oil exploration area, it is entering the later stage of construction. If the internal water content of the oil resource increases, it is likely to cause rapid hardening of the entire process. To effectively
prevent this problem, it is necessary to choose more effective mining technology to ensure that the entire internal excess water is completely removed to ensure that the entire oil and gas well is always in an optimal working state\textsuperscript{[6]}. To achieve this work goal, it must be used through professional water-finding instruments and equipment, make a reasonable survey of the overall resource status of the oil and clarify the water seepage point generated within the whole. Through the application of professional treatment technology, the area where the water seepage point occurs is completely blocked. The best effect of the blockage is to design a new channel design for the flow path of the water, so as to thoroughly remove the excess water in it. The removal of the oil can effectively prevent the hardening of the internal process of the crystal due to the problem of water immersion and effectively improve the extraction of the entire petroleum resource.

4. Application of big data technology in oil and gas field development

4.1. Promote the further development of low-permeability reservoir development technology

In terms of water injection, big data prediction technology can be used to develop advanced water injection technology, which can effectively prevent problems such as drop in permeability caused by pressure sensitivity. Hydraulic fracturing technology is also one of the important technologies that can effectively promote the production of low-permeability oil fields\textsuperscript{[6]}. The fracturing optimization well pattern injection and production technology belongs to an original technology in China. At present, there are still some deficiencies in the use process. Therefore, it is necessary to continue to improve and popularize. This technology is mainly from a holistic perspective, using big data analysis, so that an optimal configuration state can be formed between the injection and production well pattern and the artificial fracture after fracturing, so the fracturing technology can not only promote the effective production of single well Improve and at the same time increase the recovery factor. To this end, key research should be carried out to improve the prediction accuracy of the fracture location and to accurately predict the injection and production direction of the well pattern. The application of technologies such as complex wells and horizontal wells can also promote the effective improvement of single well production in oil fields. The horizontal wells need to be split and layered to promote oil well stimulation. Using big data to make predictions, for low-permeability wells that are unable to inject water and have low water absorption capacity, gas, nitrogen, oxygen, carbon dioxide and other gases can be injected to perform oil displacement. Among them, carbon dioxide also has the effect of reducing greenhouse gas emissions. If the near-mixing conditions are similar, the recovery factor in the oil field can also be effectively improved.

4.2. R & D of replacement technology in the development process of heavy oil

In the course of several years of development, the average output of heavy oil fields has been more than 10 million tons, but there is a problem of insufficient reserve reserves, stable production cannot be achieved and the effect of high-round steam throughput has also been reduced. Judging from the current development status, the basic conditions are good and the heavy oil reserves that can be effectively used are gradually declining, resulting in the continuous decrease in the overall oil supply capacity of the oil field and the reduction in the pressure of the stimulation well. The production-to-oil-gas ratio has also been successively reduced. At the same time, a large number of main modules have basically completed encryption adjustments and the encryption potential is insufficient. Therefore, big data should be used to focus on the new replacement technology to
improve the changing trend of the continuous reduction of heavy oil. First of all, the mid-deep steam flooding technology is an important technology to replace steam stimulation. To this end, we should strengthen the promotion and improvement, use big data to promote the large-scale development of this acquisition technology and promote the overall improvement of the oilfield heavy oil collection efficiency.

5. Conclusion

At present, in the situation where most of the related technologies of steam throughput have not yet achieved further development, key research should be carried out on the steam throughput technology to promote the overall improvement of the throughput effect. In addition, the use of big data for steam-assisted oil draining is also an effective successor technology, which should be effectively developed and promoted.

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