Research on the Application of Offshore Smart Oilfield Construction Based on Computer Big Data and Internet of Things Technology

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Abstract. With the progress of information technology, Internet of things (hereinafter referred to as IOT) technology has been applied to all walks of life, especially in oilfield construction. With the rapid development of IOT technology, the system will produce a lot of data, which also leads to the arrival of big data (hereinafter referred to as DB). Therefore, DB and IOT technology has become an important application in the construction of offshore smart oilfield. Through the IOT technology, enterprises can save production costs, which can also improve oil and gas production. Therefore, Internet technology can make the management of oilfield enterprises more transparent, which will realize the intelligent exploitation of offshore oil. Through the construction of Marine Intelligent oilfield, we can form an open system platform, which will realize the sharing of production process and data. Therefore, this paper first analyzes the important role of DB and IOT technology. Then, this paper analyzes the construction of offshore smart oilfield.

Keywords: Big Data, Iot Technology, Smart Oilfield Construction

1. Introduction

IOT (IOT) is a data acquisition system using GPS, sensor and RFID technology. Through the data communication protocol, people can obtain the required data, which will complete the monitoring needs of certain indicators [1]. IOT technology can realize the data connection between objects and people. By identifying and sensing the changes of objects, the IOT technology can monitor and manage the whole process. Through the construction of smart oilfield, we can effectively manage the production process of offshore oilfield [2-4]. Through the monitoring of different modules, we can better manage the oilfield production, which is an important purpose of Marine Intelligent oilfield construction. Through DB and IOT technology, we can realize the sharing of production data, which will improve the oil field production efficiency. Intelligent oilfield is an artificial intelligence based on digitization, which focuses more on data collection and judgment [5, 6]. By mining data depth, intelligent oilfield can assist production decision, which will optimize the traditional process flow. Therefore, the smart oilfield has achieved the purpose of increasing storage and efficiency, which can improve oil recovery and economic benefits [7].
2. Advantages of DB and IOT technology

2.1. Architecture of IOT

The IOT includes perception layer, network layer and application layer, as shown in Figure 1.

![Figure 1. The architecture of the IOT.](image)

2.2. Improve data storage and reading efficiency

Oil and gas resources are important production resources. In the process of offshore oilfield development, the ocean often has complex and harsh environment, which needs to be combined with the distribution of oil fields to ensure the scientific application of development technology. Traditional artificial development is difficult to meet the needs of development, which leads to the low efficiency of oil extraction. Therefore, digital technology will become an important technology to change oilfield development. Smart oilfield is based on the development of digital oilfield, which can ensure the safety and environmental protection of the oilfield. Through the IOT technology, we can improve the development efficiency and quality of the entire oilfield. Through the construction of intelligent oilfield system, we can realize the whole process intelligent management of each subsystem. Some oilfield enterprises have high development costs and waste of resources, which hinder the pace of smart oilfield construction. Smart oilfield realizes the management of various production factors, which can ensure the integration, sharing and processing of various production data. Through the use of production resources and elements, we can improve the economic and social benefits of oilfield production.

2.3. Ensure the safety of production and operation

Technology is the core force to promote the construction of smart oilfield. Intelligent technology accelerates the digital development of oilfield production. DB and IOT technology has gradually changed the traditional development mode. Therefore, the construction of smart oilfield has become the mainstream trend, which makes the oilfield production more secure. Although, many oilfields have gradually accelerated the construction of smart oilfields. However, many security risks of DB and IOT technology in the production process have not been completely eliminated. Therefore, the construction of smart oilfield should strengthen the application of DB and IOT technology, which can realize the integration and processing of various production data. Through the rational use of various data,
offshore oilfield production will be more scientific, which will identify and prevent various security risks.

3. Offshore smart oilfield construction

3.1. System hardware composition

Combined with the control requirements of oil gathering and transportation station well site, this paper constructs the hardware platform of offshore intelligent oilfield system based on IOT. This layer is composed of information collection subsystem, security subsystem and application subsystem. Through a variety of sensors, the system can complete the collection of security monitoring parameters, which will be transmitted to the security monitoring center through ZigBee wireless network. The hardware platform of offshore intelligent oilfield system is shown in Figure 2.

![Hardware platform of offshore intelligent oilfield system](image)

**Figure 2.** Hardware platform of offshore intelligent oilfield system.

3.2. Construction of IOT for oil and gas production

The construction objectives of the IOT for oil and gas production are as follows. Through the deployment of well site data acquisition, remote control and monitoring system, we can realize the whole process control of various production wells, stations and pipelines. Through the IOT, we can achieve the effect of automatic perception and unattended of well site, which will achieve the goal of improving labor production efficiency and safety production. Through the flat integrated management platform of production equipment, enterprises can reduce the management level, which will improve the management effectiveness. In this paper, the control of pumping unit is established by IOT technology, as shown in Figure 3.
4. Application strategy of DB technology in smart oilfield construction

4.1. Improve top design
Smart oilfield construction must improve the application level of DB technology, which will ensure the safety of oilfield production. Managers should adapt to the new situation, which needs to improve the system from the top-level design. Therefore, DB technology has become "normalized, standardized and institutionalized" in the construction of smart oilfield. Through the overall planning of DB technology, we can apply it to all elements and levels of smart oilfield construction, which can concentrate effective resources. By building an open and sharing platform for oilfield data, enterprises can formulate the scope boundary of data sharing among departments, which will promote the vigorous development of DB technology.

4.2. Strengthen safety management
Safety concerns everything. Safety is the basic guarantee for all production activities, especially for oil enterprises. However, many oil companies do not do a good job in safety management in the process of exploitation, which brings a series of security risks. Through the establishment of safety management system based on DB technology, the safe production of oil field will be safer. Oilfield production is a complex and arduous system engineering, which is the difficulty of implementing oilfield safety management. Therefore, oil field enterprises should establish safety management consciousness. Through the establishment of safety production management system, enterprises can restrict the behavior of staff, which will form a production mode in line with the requirements of safety management. At the same time, enterprises should carry out pre job training for relevant staff, which can enhance their practical ability to deal with complex problems. By comprehensively improving the quality of safety production, we can eliminate many hidden dangers in oilfield production, which will reduce the occurrence of mistakes and risks.

5. Conclusion
The construction of offshore smart oilfield is a new trend of the times, which is the inevitable choice for the development of offshore oilfield in the future. Through DB and IOT technology, offshore
oilfield exploitation can avoid the complex and changeable environment of the ocean, which will better carry out oil exploitation. Therefore, oil enterprise managers must pay attention to the application of DB technology, which will promote the sustainable development of smart oilfield.

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