METHODS FOR DETECTING AND EARLY WARNING OF DRILLING ENGINEERING ACCIDENTS

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Abstract: As a very important part of engineering construction, drilling engineering has certain difficulties in terms of work content and construction technology. The quality of the project is difficult to control, and the safety factor is not high. Drilling engineering accident detection and early warning is a very critical part of engineering construction. It is an important method to ensure the quality of drilling engineering and an important measure to improve the level and safety of drilling construction. On this basis, the article will analyze drilling engineering accident detection and early warning methods to provide guarantee for the development of drilling engineering.
Keywords: Drilling engineering; Accident detection; Early warning method

1 FACTORS AND CURRENT SITUATION CAUSING DRILLING ENGINEERING ACCIDENTS

With the continuous development of social economy, the demand for petroleum resources in social production and life is increasing, the consumption of petroleum resources is also increasing year by year, and the work intensity of drilling projects is also gradually increasing. As the main method of oil extraction, drilling engineering is characterized by high risks and harsh environment. Once a drilling accident occurs, it will cause huge economic losses. Therefore, in order to ensure the quality of oil extraction, accident detection and early warning work need to be fully implemented to minimize the mining accident rate, which has positive significance for promoting the development of drilling engineering[1].

In the implementation of drilling projects, terrain and man-made factors are the main influencing factors causing drilling engineering accidents. On the one hand: terrain factors. In the development of drilling projects, terrain is a very dangerous factor. Complex and changeable terrain will affect the smooth operation of drilling work to a certain extent. In addition, if the geographical environment is harsh and the underground rocks are chaotically distributed, it will also cause damage to the drilling equipment and affect the construction quality of the drilling project. On the other hand: the human factor. Construction personnel are an important part of the drilling project and have a certain impact on the quality of the drilling project. For example, during the drilling construction process, if there are problems with the drilling staff's working ability, drilling methods, and judgment choices, it will not only affect the construction quality of the drilling project, but also cause safety accidents and hinder the normal operation of the drilling work[2]. At the same time, if the technical level of drilling construction personnel is limited and unable to cope with the complex and changeable drilling environment, it will also increase construction safety risks and hinder the improvement of drilling quality. Based on the current situation of accident detection in drilling engineering, with the continuous development of science and technology, information technology has been widely used in the development of drilling technology. Applying information technology means to drilling projects can use information technology equipment to carry out risky construction operations, reducing the probability of accidents to a certain extent[3-4]. However, in actual drilling projects, relevant detection and early warning technologies are still not perfect, and drilling engineering accidents often occur, which have an impact on the normal operation of drilling projects. For example, using engineering parameters to judge the status of the project is a commonly used detection and early warning method. However, this detection method has certain shortcomings. The flexibility and variability functions are not perfect, and it cannot effectively deal with complex drilling projects.

2 ANALYSIS OF DRILLING ENGINEERING ACCIDENT DETECTION AND EARLY WARNING METHODS

2.1 Proper Application of Drilling Instruments

Drilling instruments are common tools in drilling engineering. With the development of the oil exploration industry in recent years, drilling instruments have been improved and improved to a certain extent, and have been transformed from single detection equipment into digital equipment. At the same time, it has been integrated with microprocessing technology and remote sensing and remote control technology, and has become an important drilling tool, which is of great value to the quality of drilling engineering accident supervision[5]. Therefore, during the construction of drilling projects, drilling instruments can be reasonably installed on the drilling construction equipment to ensure that the drilling project content can be fully and effectively supervised, and real and effective drilling project data can be obtained to provide reference for fault detection and analysis[6]. Drilling technicians can conduct safety analysis based on the data provided by drilling instruments to effectively prevent accidents.

2.2 Application of Drilling Tool Vibration

Drilling tool vibration is an advanced drilling technology. During the construction of drilling projects, the interaction between rocks, drill bits, well walls and drill strings will cause drilling tools to vibrate. However, in the actual application process, the stress generated by the interaction between various factors is very complex[7]. It is necessary to use a MWD measuring instrument to effectively analyze the dynamic characteristics in order to fully understand the interaction forces. During the specific drilling process, the vibration conditions of the drilling tools can be analyzed to effectively monitor the working status of the drilling tools and drill bits, and prevent resonance and resonance phenomena. However, due to the limitations of the application of drilling tool vibration analysis technology, the scope and role of supervision are very small, and the application value is also relatively limited.

2.2 Utilizing Parameter Sensors

In drilling engineering construction, many drilling instruments are used, and parameter sensors are one of the important ones. Parameter sensors can convert the perceived drilling engineering information into specific data. For example, the felt force can be converted into pressure data; the felt water flow impact can be converted into hydraulic data. These data can help technicians judge the accuracy of the drilling project. status, showing the signal warning of the drilling project. At the same time, in drilling engineering, rational use of signal processors is also a way to improve the quality of accident early warning. When the signal processor receives the parameter sensor data, it will analyze, process and judge it, and then reflect the analysis results to the display system to provide reference for accident warning work. This can not only optimize the quality of drilling engineering data detection, but also eliminate drilling hazards in a timely manner and reduce the probability of accidents.

2.3 Develop Anomaly Prediction System

In the construction of drilling projects, the relevant technical departments can develop an abnormality prediction expert system, integrate fault diagnosis methods into it, and combine it with parameter sensors, signal processors and other equipment to comprehensively analyze and collect various data information to build corresponding drilling systems. The engineering anomaly prediction expert system performs early warning analysis and processing on these data. For example, the drilling engineering construction department can combine computer and artificial intelligence technologies to comprehensively utilize multiple drilling instruments and equipment to monitor and predict the status of the drilling engineering to provide quality assurance for early warning work. In this way, it can not only improve the efficiency of early warning and monitoring of drilling engineering accidents, but also improve the quality of drilling work and promote the healthy development of drilling work.

3 CONCLUSION

All in all, in order to cater to the high demand for oil extraction, drilling projects need to strengthen engineering accident detection and early warning measures on the basis of ensuring work quality and efficiency, and create a safe construction environment for drilling work. At the same time, by analyzing the current situation of drilling engineering accident detection, making full use of parameter sensors, drilling tools and drilling instruments, and combining it with the expert prediction system, we can further optimize the quality of drilling engineering accident detection.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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