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REVIEW ON THE DEVELOPMENT OF UNDERGROUND ENGINEERING MEASUREMENT TECHNOLOGY IN MINING AREAS

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Abstract: With the innovation and progress of science and technology, China's underground measurement technology has also been well developed, and has rapidly transformed from simple surveying and mapping to digital automated surveying. painting technology. Using underground engineering measurement technology, we can complete tasks such as positioning and detection of minerals, providing many methodological supports and methods for the exploration of the field of underground measurement in China. technical foundation. At present, China's underground measurement technology is not yet mature, but it is gradually transforming from traditional measurement technology to new measurement technology. In short, we must work hard Develop my country's science and technology, improve the level of underground measurement technology, conduct comprehensive processing and analysis of relevant data, and strive to promote the application of underground engineering measurement technology in other fields.
Keywords: Underground; Engineering surveying; Technology development; Future prospects

1 TRADITIONAL UNDERGROUND ENGINEERING MEASUREMENT TECHNOLOGY

In order to develop mineral resources in deep mineral strata and further utilize underwater resources and matter, First, it is necessary to conduct underground positioning measurements. It is also the basis of underground engineering measurement. There are many underground positioning measurement methods, which use different working principles and are affected by different factors. In short, each has its own advantages and corresponding disadvantages. At present, traditional engineering surveying technologies include optical positioning method, echolocation measurement technology, radio positioning method, and side scan sonar technology. New engineering surveying technologies include satellite positioning technology, airborne laser underground measurement technology, single-beam sounding and multi-beam Bathymetric surveying technology and more. This article focuses on these two categories of underground engineering measurement technologies. The advantages and disadvantages of each technology and the corresponding working principles and working methods are described and explained in detail.

1.1 Optical Positioning Method

Optical positioning methods are often limited by many factors, such as the curvature of the earth, the Visual inspection, etc., which directly leads to the reduction of downhole measurement accuracy, and the data reading is also very easy. It is prone to errors, but usually the optical positioning method is simpler to operate manually. one, It is also more convenient to use. The principle of optical positioning measurement method and the method of land surveying Same, The main instruments used are theodolite, distance measuring instruments, etc.

1.2 Radiolocation Method

Radio positioning method is mainly based on radio signals to obtain accurate location The parameters of the physical location, It is mostly used for measurements in areas with poor hydrogeological conditions. radio Wave, Almost unaffected by weather changes, It is beneficial to engineering measurement and determination Bit, It is mainly divided into ranging positioning and ranging difference positioning methods. Ranging positioning is usually used for short-distance measurement, and the ranging accuracy is high and the distance it affects is small. The ranging positioning is completely opposite to the ranging positioning. It is often used for long-distance measurements, But test The accuracy of the quantitative data is very low.

1.3 Echolocation Measurement Technology

20 century In the 1920s, echo sounders appeared, and echolocation technology could also To be applied to geological surveying technology, the principle is to emit sound waves and receive well The sound waves returned from the waterlogged area below, The time passed back through the echo, and then determine the well depth and various conditions. Measurement feedback results are rapid, And can achieve continuous recording of data. However, this method also has certain limitations. It is only a line measurement without any method to realize the display function of

terrain and landforms, And often when encountering dangerous terrain, No It will not only make the measurement data inaccurate, but also bring certain problems to the engineering construction equipment. Danger.

1.4 Side Scan Sonar Image Enhancement Technology

20 In the early 1950s, humans discovered the side-scan sonar measurement method. Until the late 1990s, downhole measurement technology developed rapidly, and side-scan sonar image enhancement technology also took a big step forward, eventually realizing side-scan sonar Automated digitization using nanotechnology. Its biggest function is that it can generate two-dimensional images of mines. side scan sonar, Its main principle is to use echo to collect data and return it at different times, thereby converting the sound signal into an electrical pulse signal to realize the information transmission function. Side scan testing technology mainly relies on the movement of the device. In this process, the entire underground scan is completed. Then the detected data is transmitted to form a two-dimensional black and white image and displayed on the monitor as shown in Figure 1 As shown in the figure, it can display the topography and landforms, thereby presenting a complete geological picture of the mining area, making it easier for people to further study the underground world. The current side scan sonar mode has been converted from two-dimensional to three-dimensional mode, thereby improving the measurement efficiency and achieving more accurate results.

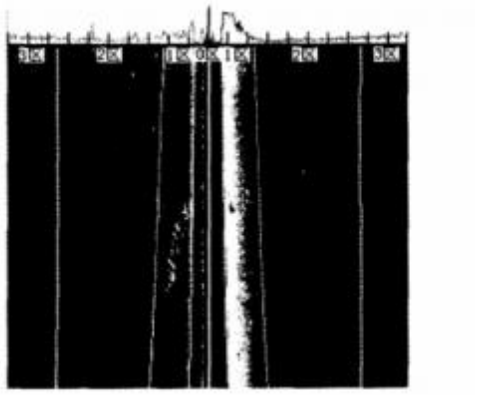

Fig. 1 Signal dynamic partitioning

2 NEW UNDERGROUND TERRAIN DETECTION TECHNOLOGY

2.1 Satellite Positioning Technology

The current new measurement technology is very sophisticated and the system is relatively complete. As far as satellite positioning technology is concerned, Our country generally uses navigation-type dynamic receivers. Conduct underground Detection, its main function is real-time dynamic positioning. In order to improve the accuracy of the satellite system , a differential positioning system can also be used; by enhancing wide-area differential technology, This improves the accuracy and reliability of the measured data. But the shortcomings of satellite technology, That is, the distance between the mobile station and the base station established is different, which will bring different impacts. As the distance increases, the error increases, resulting in a decrease in accuracy. Therefore, the distance seriously affects the function of this technology.

2.2 Airborne Laser Downhole Measurement Technology

20 In the early 1970s, airborne laser downhole measurement technology was proposed. For now , laser technology is one of the most promising technologies. It mainly uses aircraft as a carrier platform. When the laser reaches the bottom of the mineral seam, encountered obstacles, And then it's reflected back onto the plane, It takes two laser passes, Can determine the depth of the water bottom. Laser technology mainly consists of five parts, including water depth measurement, navigation, data analysis and processing, monitoring and ground receiving and processing systems. Downhole engineering measurement technology is becoming increasingly mature, equipment and equipment tend to be intelligent, and digital It is also lighter and smaller. The precision and accuracy of the measurement data should also be obtained For further improvement, data processing software should also be developed to meet different needs.

2.3 Single-Beam Bathymetry and Multi-Beam Bathymetry Measurement Technology

20 In the early 1990s, digital and automated sounding systems have been widely used. This system includes positioning equipment, downhole sounders, as well as data acquisition equipment and related processing software. Its biggest advantage is complete automation, number data processing. Through positioning equipment, you first need to determine

the detection location. Then the depth sounder The detector detects geographical data, then transmits and stores it to The computer waits until all this is over and then uses data processing software to analyze it to sort out the erroneous data. and then correct or delete it, to obtain accurate measurements data.
Multi-beam sounding technology is an underground detection technology that was extended after the emergence of single-beam sounding technology. Compared with the previous single-beam measurement method, it can achieve higher measurement efficiency, more accurate description of underground terrain, and wider coverage area. The multi-beam sounding system can perform sea sweeping measurements and detect obstacles underground with high accuracy. It measures the round-trip time and angle of many beam signals and combines it with relevant data to accurately calculate the measured depth, and promotes the further improvement of downhole measurement technology. Multi-beam sounding technology uses the detection of a series of beams. The final result is to integrate the data of all transmitted beams, and finally analyze and merge the data to obtain accurate depth measurements.

3 PROSPECTS FOR THE FUTURE DEVELOPMENT OF UNDERGROUND ENGINEERING MEASUREMENT TECHNOLOGY

By analyzing the traditional mine terrain detection technology and gaining a detailed understanding of the current new mine terrain detection technology, we can then understand the development history of underground depth measurement technology. A comprehensive and holistic description was given. In order to better improve measurement technology, try to improve me country's science and technology, Make good use of computer intelligence and now mature navigation technology technique. This has further improved the downhole measurement technology, Improving the accuracy of measurement technology High, while improving the comprehensiveness of underground terrain detection technology, Let energy mining companies improve Work efficiency.

4 CONCLUSION

Down hole measurement technology requires us to work harder to improve it and add more measurements. Measurement means, change the method of measurement technology, strive to improve the accuracy of measurement, ensure the accuracy of measurement technology, and increase the functions of measurement technology to meet different needs and promote Taking the development of underground measurement technology to a higher level

COMPETING INTERESTS

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

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