Application of automation technology in Coal Mine Ventilation System

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Abstract: with the rapid development of China's economy and the continuous growth of the industrial industry, the demand for mineral resources is increasing. China is a large coal producing country, and the annual consumption of coal resources is very large. In coal mine production, it is very important to prevent gas explosion. The gas explosion accident is mainly due to the unreasonable ventilation system of coal mine, so improving the ventilation system of coal mine is the key research topic of coal mine units. The application of advanced automatic control technology to the ventilation system of coal mine can promote the rationalization of the ventilation system of coal mine, This paper introduces the importance of automatic control technology in the application of coal mine ventilation system and the principle and process of automatic control technology for the whole ventilation system, hoping to contribute some ideas to promote the continuous maturity and improvement of coal mine ventilation system.

Key words: coal mine ventilation system;automatic control technology; application research

Ventilation is an important part of coal mine production, and ensuring the integrity of coal mine ventilation system is the basic premise to ensure coal mine safety production. Using the automatic control technology of coal mine ventilation system to monitor and control the ventilation space of coal mine and make corresponding adjustment in time can strengthen the ventilation effect of coal mine, reduce the occurrence of gas explosion and other accidents, and ensure the safe production of coal mine. In short, the emergence of automatic control technology has greatly improved the efficiency of coal mine ventilation system and reduced the consumption of human and material resources.

1 Automation technology theory of coal mine ventilation system

Coal mine ventilation automation control technology is the use of automation technology, controlled by the main control station and sub station. Among them, the main task of the substation is to monitor the whole working environment of the coal mine, detect the wind pressure in the coal mine, monitor the amount of gas produced in the process of coal mine work in real time, and upload the observation data to the master station computer in time; The substation controls the whole ventilation system through the automatic control device, so that the whole ventilation system can reach the level of automatic operation. Through the analysis of the working principle of the coal mine ventilation system, we can find that the automation technology can more comprehensively control the air pressure and temperature of the mine, and can also be operated and processed separately through different control units. The design of main station and sub station can effectively improve the ventilation efficiency. With the continuous development of automation control technology, coal mine ventilation automation control technology is also constantly updated and more intelligent.

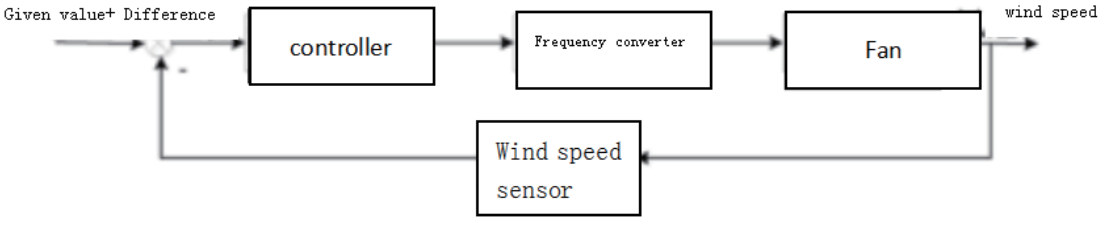

Figure 1Schematic diagram of ventilation system automation control

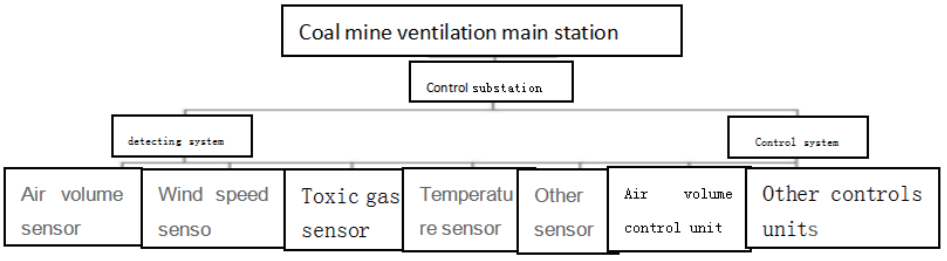

Figure 1Control instruction transfer diagram

Various toxic and harmful substances will be produced during underground production, which will cause a series of changes in the air composition in the mine, such as the reduction of oxygen concentration, the increase of carbon dioxide concentration, the generation

of mineral dust and toxic and harmful gases (such as CO, NO2, H2S, SO2,...), Temperature, humidity and pressure change. Various links of mining production, such as rock drilling, blasting, ore transportation, transportation and crushing, will also produce a large amount of dust. Therefore, the rationality, reliability and stability of mine ventilation system is an important guarantee to ensure the coal mine to resist disasters, reduce gas and expand fire accidents. Active application of automatic control technology in coal mine ventilation system and automatic monitoring and management of coal mine ventilation space can effectively improve the safety of coal mine ventilation system and ensure the smooth progress of the whole coal mine production.

2 Functions of automation technology of coal mine ventilation system

1. Effective control

At present, with the optimization and upgrading of China's machinery industry, automation control technology is becoming more and more popular. In many core components of automation control technology, open-loop and closed-loop are the two most important parts. Closed loop refers to the implementation of detection of the state in the process of coal mine production and operation, and the analog signal is converted into digital information and fed back to the control device through the sensor. The control device compares the feedback data with the standard data, and then transmits instructions to the ventilation system. The greatest function of the closed-loop system is to monitor and remedy at any time. Open loop control is to control the signals received by the system through various control systems and use them in the program. The automatic control system is mainly based on open-loop and closed-loop control, so the electronic technology can use program control to realize automatic control.

When the mine double fans are locked and the coal mine is in operation state, the ventilation system operates as the main fan and the auxiliary fan is in static state; When the main fan fails, the auxiliary fan can play a role. Because the ventilation system is complemented by the main and auxiliary fans, the automatic control system must have high sensitivity. The automatic control system is usually installed with a special control drive circuit, which can efficiently transmit and share information. On the basis of the control drive circuit, it is also combined with DSP control chip to fuzzify the information, control the fan based on the output signal, and keep the gas in the mine in the normal range.

2. Fault detection function

Because the automatic control system must work normally to transmit the data in the mine to the outside world, and the outside world can receive the alarm and help information in case of emergency, the automatic control technology of the coal mine system needs regular maintenance and repair in the operation process. After receiving the alarm signal, the staff of the control system will quickly understand the mine situation and analyze the data, and report the situation in the mine to the rescue personnel. At this time, the role of the standby blowing device appears, which can meet the needs of coal mine ventilation in an emergency and prevent accidental injury and danger.

3. Information collection function

In view of the important role of ventilation system for coal mine safety production, coal mine production units are exploring how to improve the sensitivity of ventilation system. Compared with the ordinary ventilation system, the automation technology control ventilation system has higher sensitivity. It can not only detect and eliminate the internal faults of the coal mine to reduce accidents, but also more accurately perceive the wind signal of the ventilation system, so that the coal mine production units can form a more accurate grasp of the operation of the mine ventilation system. At the same time, the automatic control system can also store some programmed information to support the daily work of the ventilation system staff.

3 Specific application of coal mine ventilation system automation

1. Sensor applications

The main components of the sensor include detection element and generator. First of all, the signal generator plays the role of transmitting various signals. In the process of receiving and transmitting information, the time division system or frequency division system is mainly used. Among them, the circuit structure of frequency division transmission mode is relatively simple, the transmission is relatively stable, and the fault is relatively few, so it is most commonly used in the process of circuit signal transmission. The detection element is mainly able to measure the application of the mine in real time, but when using the detection element, sensors need to be installed in various roadways. There are many kinds of indicators of the detection element, such as temperature, air volume, etc., which need the wind speed detection element to measure the remote air volume. The commonly used wind speed detection elements usually include thermal anemometer, constant temperature anemometer and constant current anemometer. If the wind pressure is to be measured remotely, differential pressure transmission must be used, mainly using two detection methods: constant potential electrolysis method and infrared absorption method.

2. Ventilation application

The main function of automatic control technology in ventilation system is to control the air volume. During the use of the ventilation system, the air volume is mainly controlled by changing the angle of the louver. After the application of the automatic control system, the system can automatically control the angle of the louver, and then realize the automatic control of the air volume. The automatic control system continues to detect the air volume data in the mine, transmits the measured signal to the central control console, and the central control console analyzes the data, automatically adjusts the blade angle, and then controls the air volume within a reasonable range.

At present, some countries have developed the technology of controlling the speed of local fan, mainly by analyzing the concentration of a certain gas or the change of air temperature caused by the operation of the driving fan, and then issuing the control command. At present, China's technology in this area is not perfect, but there is no doubt that this technology has important reference value for the optimal design of ventilation system.

3. Control application

Each monitoring station has a central control system. The main function of the central control system is to analyze the information transmitted by each sensor and issue instructions to each system based on data. The computer is the basic content of the central control system, with many computer interfaces, strong expansibility, fast operation speed and high precision, which can realize the optimization of the whole automatic control process.

When the automation technology processes the ventilation system of coal mine, it must be controlled automatically according to the data of each stage of the ventilation system. In order to analyze the operation status of the ventilation system, technicians also need the data of the system operation. Therefore, data printing is also one of the important tasks of the system. All historical data and real-time data need to be called in time, so that they can work more efficiently, reduce unnecessary trouble as far as possible, and ensure that specific problems have specific data to rely on.

4. Monitoring and application of data information

Only by accurately obtaining the relevant information and data of the ventilation system can we effectively ensure that the regulation work has strong effectiveness, rationality and pertinence. Generally, the coal mine ventilation system needs to carry out real-time monitoring of the ventilation situation in the mine, comprehensively considering the data of the temperature, ventilation volume, air pressure and air composition in the mine. At the same time, the staff should carry out data information monitoring according to the operation status of various equipment in the ventilation system to ensure the safe and stable operation of the coal mine ventilation system, so as to better promote the sustainable and healthy development of the coal mine industry.

The application of automation technology in coal mine ventilation system needs a lot of information and data as support. At the same time, the collection of various data needs to pay attention to the effectiveness of information. Therefore, it is necessary to strengthen the management of data and information monitoring equipment, use information data to complete all-round technical processing work, and provide correct processing response. Enhance the performance of the ventilation system. According to the actual situation, the targeted regulation and processing work is carried out. Combined with the monitoring information data, all kinds of effective data are transmitted to the sensor components to strengthen the monitoring connection between the data of various regions of the coal mine, so as to form a unified whole. When the data is applied to the ventilation system, the data processing should also be timely and accurate.

At present, in the process of collecting data, the development of real-time monitoring needs to fully consider the air change, air composition, wind pressure and wind speed in the mine, temperature in the mine, etc. In order to effectively improve the operation efficiency of the ventilation system, it is necessary to strengthen the timeliness of the monitoring system, so that it can timely feed back to the host when encountering problems, and propose solutions for specific problems, so that the whole ventilation system is in a stable operation state.

5. Application of automatic fault handling

In recent years, due to the long operation time of coal mine ventilation system and the harsh internal working environment of the mine, the staff need to regularly inspect and maintain the mine to eliminate potential safety hazards. The daily inspection and maintenance work can not only ensure the normal operation of the ventilation system, but also extend the service life of the system related equipment and promote the progress of innovation and development of coal mining enterprises. However, with the application of automatic control technology, the actual operation status of the coal mine ventilation system is detected and analyzed by the automatic control technology. Once abnormal phenomena are found, the monitoring system will send an alarm to facilitate system maintenance. Once problems are found, personnel can carry out maintenance work in time. In addition, the application of automation technology can automatically repair the relatively simple safety faults in the ventilation system, self monitor and analyze the fault parts and components, and carry out automatic maintenance as far as possible in the case of fault expansion, so as to promote the ventilation system to return to normal in time, and further improve the daily safety operation efficiency and level of the system.

4 Improvement measures for automation technology of coal mine ventilation system

The important role of the automatic control system is also to improve the automation degree of the whole ventilation system through the automatic frequency conversion of the system. Even a small control or operation can realize the interconnection and cooperation between the frequency of the original control system and the frequency. IdenticalIn case of emergency, it can be switched with the original control system in time to meet the wind power demand in the coal mine and adjust the wind speed reasonably. In the process of adjusting the wind speed, it can also be adjusted according to the changes of temperature, noise and other external environment, so as to extend the service life of the whole system equipment. After the adoption of automation technology, the ventilation system can be developed in the direction of energy saving. For coal mines, it can effectively reduce costs, improve production safety, and promote the more efficient operation of the whole coal mine. epilogue

The coal mine ventilation system adopts automatic control technology, which can not only realize the remote monitoring and control of its internal and external environment, but also timely understand the air pollution problems and equipment operation status in the mine

Discussion on the Ways to Improve the Effectiveness of Vocal Music Teaching in Colleges and Universities

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Abstract: Vocal music is an important part of higher education in China. It focuses on cultivating students' vocal music ability and comprehensive quality, and is also a key part of education to cultivate students' sentiment and improve their appreciation and aesthetic ability. As a part of aesthetic education, vocal music teaching requires college teachers to optimize teaching, set up interesting teaching activities, help students lay a solid professional foundation and improve their music quality. At this stage, there are still some problems in vocal music teaching in colleges and universities, such as the lack of a strong learning atmosphere, the lack of innovation in the curriculum model and the assessment model. front-line teachers still need to implement specific reform measures and upgrading paths to promote the comprehensive reform of vocal music teaching in colleges and universities. In view of this, this paper discusses the path to improve the effectiveness of college vocal music teaching and innovative strategies, hoping to provide more reference for front-line educators.

Keywords: college vocal music; Existing problems; Promotion path; Innovation strategy

Introduction

Vocal music teaching in colleges and universities focuses on strengthening students' music foundation and cultivating students' music literacy. Therefore, in teaching practice, teachers should start from cultivating students' music aesthetic ability, music expressiveness,

through the information obtained from the monitoring, and give the corresponding early warning response signal to help the monitoring personnel make control and rescue measures in time. In addition, after the realization of automatic control, the equipment needs to be adjusted according to the data to effectively reduce the accidents in the coal mine and improve the safety of the staff in the coal mine. The automatic control system can also help us understand the hydrological conditions inside the mine, accurately predict natural disasters, ensure the safety and stability of coal mine production, and reduce and prevent accidents.

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