



# Discussion and Practice of Coal Mine Production Automation Information Construction<sup>1</sup>

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## Abstract

Coal resources play a crucial role in modern society as a significant energy source, impacting various industries and the livelihoods of individuals. However, coal mining involves strenuous labor and operates in a specialized environment, posing challenges such as water seepage and gas leakage that threaten worker safety and health. To tackle these challenges, enterprise leaders can invest in automation, information technology, and equipment to replace manual mining methods. This investment can enhance mining efficiency and quality, reduce production risks, lower management costs, and improve the overall operation and development of coal enterprises. This paper provides an analysis of the implementation of automation and information technology in coal mine production.

## Keywords

Coal mine production, automation, information technology

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## 1. Current status of coal mine production

Coal mine production is a comprehensive undertaking, primarily conducted underground. Upon extraction, coal is transported to the surface via a long-distance system and then to sales areas using specialized vehicles. Workers spend extended periods in the underground environment, necessitating adequate and stable provisions of water, power, pressure, ventilation, and drainage by relevant companies. Modern technology and equipment are utilized to monitor real-time data on mine pressure, carbon monoxide, gas, and coal dust concentration. Mining involves the collection and transportation of coal resources from the mine through the destruction of coal seams, making it susceptible to geological movements and safety hazards. Thus, technical and managerial personnel must continuously monitor the mine's interior and the coal mining process, implementing comprehensive support and protective measures to ensure worker safety [1].

## 2. The importance of information construction of coal mine production automation

### 2.1 Realize remote mining control

In the process of coal mine production, it is highly susceptible to geological phenomena, leading to safety accidents. In order to avoid these problems, business leaders can utilize automated information technology and equipment to monitor mechanical equipment for autonomous mining and achieve remote mining operations. Excavation control can reduce

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labor costs and prevent safety accidents. Additionally, technical and managerial personnel can utilize information technology to monitor the underground mine site in real-time. This allows them to provide feedback to the operators, enabling them to have a comprehensive understanding of the specific conditions at the site. Through analysis and detection, the probability of safety hazards is clarified. Response, prevention, and control plans are formulated promptly to enhance and improve coal mine production safety [2].

## **2.2 Reduce labor intensity of workers**

In northern our country, due to the cold climate in winter, in order to ensure people's heating needs, the local government needs to purchase a large number of coal resources before heating, which requires coal mining companies to continuously dig into deep seams; as the construction depth increases, the difficulty and workload of workers are constantly increasing, which leads to an increase in the probability of safety hazards. By strengthening the construction of automation and informatization of coal mine production, manual mining methods can be replaced, and mining efficiency can be improved with the application of large mechanical equipment, while reducing work labor intensity, fully meeting the demand for coal resources from all walks of life in society.

## **3. Common technologies for coal mine production automation and informatization construction**

### **3.1 Mine-wide integrated automation system**

In the process of modern coal mine production automation and informatization construction, the mine-wide comprehensive automation system is one of the common technologies. It mainly utilizes automated informatization technology to monitor the interior of the mine in real-time, collects comprehensive monitoring information, and transmits it to the central control computer. By analyzing, integrating, and using this as a reference, formulate corresponding control procedures to achieve remote and intelligent control of the internal mine environment. This will help address identified safety hazards, ensure the safety and stability of the production process, and ultimately enhance the economic benefits and efficiency of the coal mining enterprise. Enhancement of social benefits [3].

### **3.2 Production automation control system**

When the coal mine production automation information construction work is carried out, technicians can use the laying of optical cables and collect feedback signals to facilitate the control personnel to fully understand the production and operation status of the internal equipment in the mine. At the same time, they can also use remote control systems and video surveillance A collection of equipment, remotely supervising and controlling the equipment to ensure that when a certain equipment fails, the operator or on-duty personnel can detect it in time, and accurately determine the type and scope of the problem by analyzing the feedback information from the monitoring system, and then contact the technical or technical personnel Maintenance personnel handle it to ensure that it will not affect the later production process [4].

### **3.3 Personnel positioning system**

As an important part of modern work, staff's professional qualities and technical abilities greatly affect the level of actual work; therefore, in the construction of coal mine production automation information, business leaders need to use personnel positioning systems to understand in real time. The location and specific conditions of employees in each department ensure that when a safety accident occurs during coal mining, personnel can be found in time to investigate the site and reduce casualties; in actual work, the company management can cooperate with the personnel positioning system for each employee, the system regularly sends signals to the time-divided antenna set up on the mining surface, and then the antenna can transmit the signal to the ground host and terminal equipment, which facilitates ground personnel to understand the location of mine workers, and facilitates ground personnel to promptly respond to safety accidents after they occur [5].

### **3.4 Production scheduling and communication platform**

At the same time, in the process of coal mining, production scheduling, and communication work are one of important contents. When carrying out automation and information construction work, technicians can establish a corresponding comprehensive information platform for production scheduling and communication, and use modern instruments and equipment to monitor the interior of the mine. Monitoring is carried out to determine whether abnormal conditions occur, and appropriate scheduling can be carried out according to the actual mining progress to provide convenience for coal mining and other aspects [6].

### 3.5 Smart coal mine construction

In addition, in the process of coal mine production automation and informatization construction, smart coal mine construction is also one of the common technical waterproofing. It mainly relies on the application of modern information and other advanced technologies to transform the traditional two-dimensional plane production and information transmission methods of coal mines. Combined with BIM and other technologies, the information obtained from coal mine surveys and real-time monitoring can be comprehensively collected, sorted, and analyzed, and simulated through computers to intuitively reflect the specific conditions of coal mining. At the same time, three-dimensional visualization technology can be used to encourage supervisors to conduct safety inspections on various aspects of the coal mine. An intuitive understanding of monitoring locations and monitoring results can maximize the effectiveness of coal mining scheduling, production safety, and rescue.

## 4. Development trend of coal mine production automation information construction

### 4.1 Centralization trend

In the current period, to enhance the development of coal mine production automation and informatization construction, leaders of coal mine enterprises need to improve coordination and cooperation with relevant departments. They should organize professional and technical personnel to conduct thorough investigations and gain a deep understanding of the enterprise's production and operation models. Additionally, they should research automation and informatization technology and equipment. Adjust the innovation to fully meet the production and operational needs of the enterprise after practical application, and transfer the monitored data into the computer system. Managers will analyze and evaluate the computer system's calculation and processing flow to determine the effectiveness of operational control. Simultaneously, technicians must meticulously review the computer's troubleshooting process, develop specialized computer program codes based on the production model, and oversee remote and centralized control of the production equipment operation process to replace manual operations. This approach aims to reduce labor costs, enhance coal mine production efficiency, and improve safety.

### 4.2 Intelligent trend

On the other hand, in the coal mine production process, company leaders can invest a lot of financial resources according to the needs of automated information construction, introduce computer, network information, and other technologies, carry out intelligent management and control of various production processes, and also improve data transmission. With the convenience of remote control of the equipment, various production links can be intelligently integrated. When a problem occurs in a certain equipment or production link, the operator can use the computer system to conduct analysis and research, formulate a scientific and reasonable treatment plan, and provide better solutions for coal mine production. Provide sufficient guarantee for efficiency and safety [7].

## 5. Conclusion

In conclusion, the advancement of modern science and technology has led to the widespread application of automated information technology and equipment in coal mining. This transformation has significantly enhanced production efficiency and quality while mitigating potential threats to worker health and safety such as water seepage and gas leakage. However, some coal companies continue to rely on outdated production methods due to the lack of R&D and innovation in automated information technology, which could adversely impact daily operations and future development. Therefore, it is imperative for local governments to organize educational initiatives for coal enterprise leaders to enhance their understanding of automation information technology and its value. Furthermore, there is a need to optimize and customize automation information technology according to each company's business model and characteristics, thereby improving organizational structure and facilitating coal mining and sales operations. This strategic approach will not only bolster economic returns and market competitiveness for individual companies but also contribute to the overall progress and development of the modern coal mining industry.

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