# Construction of Harmful Gas Monitoring System in Coal Mine Working Environment

Yijie Li [1]

[1]Guangdong Peizheng College Guangzhou, China

**Abstract:** In order to improve the accuracy, sensitivity, reliability, stability and maintainability of the coal mine safety monitoring system, and enhance the coal mine safety guarantee ability, combined with the national coal mine environmental monitoring network construction scheme and the coal mine safety production and environmental monitoring management regulations, the coal mine safety production status and environmental data are analyzed. In order to improve the production efficiency and provide reliable guarantee for the safety production of coal mine, the monitoring system of harmful gas in the working site of coal mine roadway is established.

## 1 Technical index of environmental monitoring in mine roadway

With the continuous development of the coal industry, the incidence of safety accidents is also increasing. In order to strengthen the operation management of coal mine gas safety monitoring, effectively curb the occurrence of major gas accidents, improve the level of safety management technology.to prevent the occurrence of gas explosion danger and the harm of harmful gas, timely and accurately reflect the environmental parameters of underground monitoring points and the operation status of main equipment, so as to achieve the early prediction and prediction of the harm. Once gas overrun is found, sound and light alarm will be sent out immediately, and wind, power and gas locking will be carried out to ensure the normal operation of mine production and personnel safety, as well as the normal operation of equipment, so as to meet the real-time, comprehensive, accurate and reliable requirements of integrated dispatching management on environmental safety, mining equipment, power supply system and other relevant information, and meet the requirements of safety management information system for auxiliary decision-making Information requirements.

Environmental monitoring technology involves a wide range of knowledge, which requires not only a solid foundation of analytical chemistry, but also sufficient knowledge of mathematics, physics, biology, ecology, meteorology, engineering, hydrology, geography, geology, etc. Mine environmental monitoring has the characteristics of multi-disciplinary, marginal, comprehensive, real-time, continuous, tracking, social and so on. The basic product of environmental monitoring in coal mine is monitoring data, which has a similar problem of production process finalization, analysis method standardization and monitoring technology standardization. In a sense, environmental monitoring is the factory that produces monitoring data.
The sensor of safety monitoring system adopts frequency analog signal transmission, and the frequency signal has anti-interference ability in the transmission process, and the operation is stable and reliable.

Based on the digital transmission from the monitoring node to the monitoring center, the digital transmission from the sensor to the monitoring center can realize the digitization of the safety monitoring system, enhance the ability of anti electromagnetic interference, and promote the development of intelligent sensor.

## 2 The main objects and system layout of environmental monitoring in mine and roadway

Comprehensive methods of environmental monitoring
Monitoring means include chemistry, physics, physical chemistry, biochemistry, biology, ecology and other methods that can characterize environmental quality. Due to the complexity of the matrix of environmental samples and the low content of pollutants, environmental analysis methods and monitoring instruments are required to have high sensitivity, high accuracy, high selectivity, high resolution, standardization, automation and computerization.

Monitoring objects include biogas, carbon monoxide, carbon dioxide, gas, hydrogen sulfide and other objects. Only comprehensive analysis of these objects can accurately describe the environmental quality.

Data processing is the statistical processing and comprehensive analysis of monitoring data, which will involve the natural and dynamic factors of the region.

Email :Liyijie0121@163.com

Only by comprehensive consideration and analysis can we correctly clarify the connotation of data, strengthen the comprehensive management of environmental monitoring, coordinate the relationship between various departments and disciplines, and give full play to the work efficiency of environmental monitoring system.

Continuity of environmental monitoring

Because of the variability of environmental pollution in time and space, only long-term monitoring can reveal its change law and predict its change trend from a large number of data. The more data, the higher the accuracy of prediction.

Traceability of environmental monitoring

Environmental monitoring is a complex system. Any error will affect the quality of the final data. In order to ensure the accuracy, comparability, representativeness and integrity of the monitoring results, a value tracking system is needed to supervise. Establish environmental monitoring quality assurance system.

The monitoring system distributes the monitoring nodes in different working faces underground. The monitoring system works normally, and the functions of sensing, transmission, display, control and execution are normal. In the return air flow of the heading face, the return air roadway in the mining area and the total return air roadway are set up.

Maintenance of analog sensors, regular validation reminders, working status of digital sensors, controllers, power boxes and other equipment and communication network, monitoring center monitoring software, database storage and software module communication. Prediction and early warning of gas emission and fire. In case of gas overrun and harmful gas emission, it can be automatically linked with emergency broadcast, communication, personnel positioning and other systems. In order to facilitate safety supervision and enterprise safety management, the information of gas overrun, alarm and power failure in key areas such as mining face should be encrypted and stored. The software interface of the monitoring system is friendly, easy to call and strengthen the help function.

The setting of measuring points for the environmental monitoring system is shown in the figure.

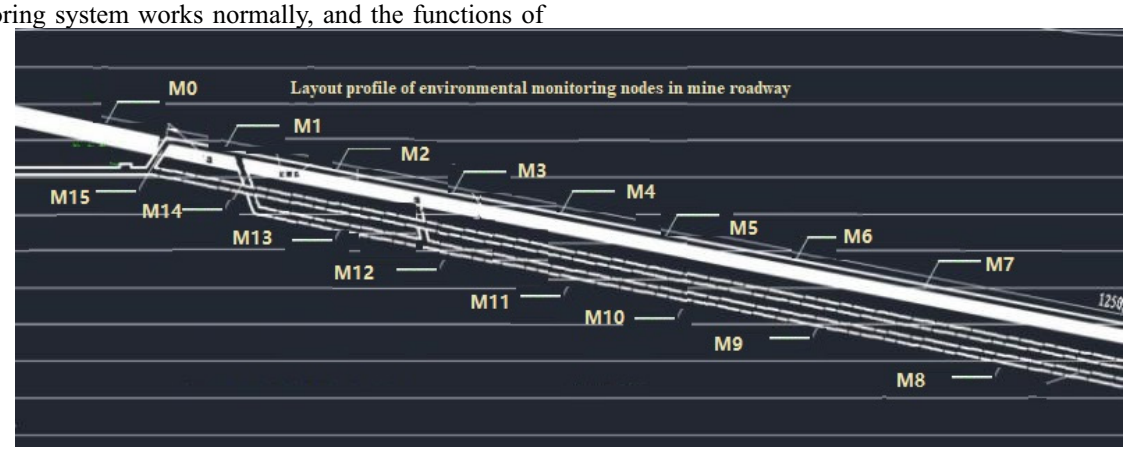


**Figure 1** deployment diagram of mine roadway monitoring node M

## 3 Node and monitoring center of mine environmental monitoring

The environmental monitoring node completes the system data monitoring, measuring point sampling, alarm, power-off and other control functions. According to the concentration of harmful gas, overrun duration, overrun range, etc., different alarm levels are set to implement hierarchical response. The setting of alarm concentration value of each level can be determined by coal mining enterprises according to relevant regulations and standards and the actual situation. According to the internal logic relationship of roadway layout and gas emission, the implementation of logic alarm can promote the correct installation, setting and maintenance of various sensors and the normal use of monitoring system.

The environmental monitoring system consists of monitoring nodes and monitoring center. The environmental monitoring node samples the information of air, biogas, carbon monoxide, carbon dioxide, gas and hydrogen sulfide to the node, which is simply processed and stored by MCU. It can do the necessary output and display, and transmit the information to the monitoring center through the communication module.

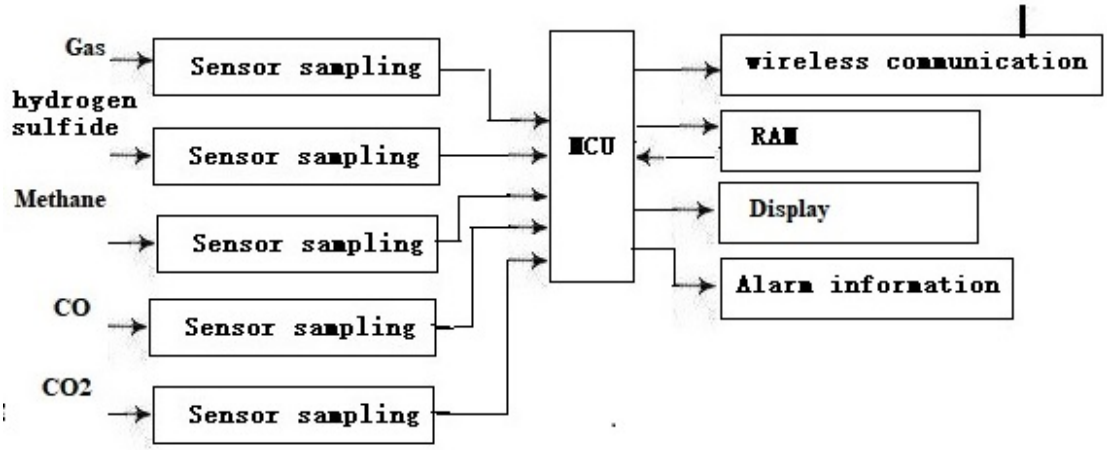


**Figure 2** composition diagram of monitoring node M

The environmental monitoring center receives the information from the environmental monitoring collection point, and then processes and analyzes the environmental information.

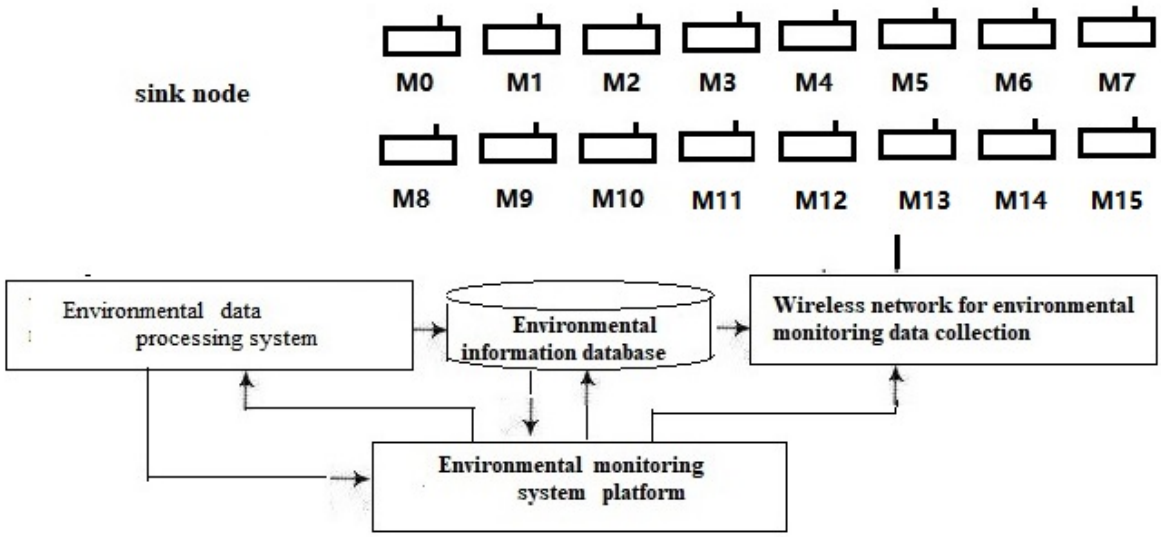


**Figure 3** composition of environmental monitoring center and monitoring node

The monitoring center is composed of wireless network communication system, environmental data processing system, environmental information database and monitoring system platform. The wireless communication system receives the monitoring data from the monitoring node and stores it in the database. The environmental data processing system processes and analyzes the monitoring data. The monitoring system control platform completes the control, scheduling and coordination of the monitoring system to ensure the coordinated and orderly work of the monitoring system.

## 4 conclusion

In this paper, according to the national technical requirements of coal mine safety production, based on coal mine safety production, the harmful gas environment monitoring system is established, the monitoring nodes are set up, and the environmental monitoring system is composed. The system performance and functional indicators meet the basic requirements of coal mine safety production, and the whole process of environmental monitoring is completed. Coal mine safety monitoring system and monitoring software have the advantages of large capacity, fast speed, more stable, more reliable, more secure, deep integration, low cost and easy installation and maintenance. In the key technologies and functions, performance indicators in the forefront of the industry.

## Reference

1. Fu,W.H. (2015) On the interactive relationship between environmental monitoring and environmental standards, the 5th Annual Conference of Yunnan Association for science and technology and Wumengshan District Development Forum.
2. Hu,J.Z.(2013) Establishing six mechanisms to break the bottleneck of environmental monitoring development in Western China, Chinese society of Environmental Sciences.
3. Wu, X.F.(2017) New thinking on Internet of things and big data [J]. Communication world.

4. Zheng, J. (2016)Research Progress on architecture and application of Agricultural Internet of things [J],China Agricultural Sciences.
5. Song, W. (2013)Analysis of development status of environmental monitoring, Chinese society of Environmental Sciences.