

# Optimization Management and Countermeasure Analysis of Coal Mine Ventilation Technology

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**Abstract:** Coal mine production is often accompanied by many safety hazards and problems, the need for technical personnel to use a variety of different technologies to do a good job of safety prevention and control work, improve safety, to avoid front-line production personnel in the process of production, due to the outbreak of safety hazards in coal mines and property safety crisis, in order to promote coal mine enterprises safer production. By improving the operation technology of coal mine and strengthening the research on ventilation technology, harmful substances such as gas and carbon monoxide can be reduced, which will continuously gather in coal mine and cause gas explosion accidents, so as to improve operation safety. This paper discusses the optimization management and countermeasures of gout technology in coal mine, and puts forward some feasible countermeasures from the basic needs of coal mine ventilation, in order to reduce the occurrence of coal mine production safety accidents, promote the better development of production operations and improve economic benefits.

## 1. Introduction

In recent years, with the rapid social and economic development of our country, the productivity of enterprises has been greatly increased, and when various social technologies continue to develop, the demand for energy becomes higher and higher. In this context, strengthening the safety management of coal mines has multiple meanings, which is not only the requirements of The Times, but also the requirements of the safety development of the coal industry. Therefore, strengthening the safety management of coal mine resources has a very important role. If you want to continue to promote the normal production and development of coal mining operations of coal mining enterprises, it is necessary to ensure the production quality of coal mines on the basis of obtaining strong coal resources. However, with the continuous increase in the depth of coal mining, the gas content in the mine increases significantly and spreads rapidly, which greatly increases the production risk of mine production staff. If the operators cause sparks due to personal negligence, etc., then it is likely to lead to the occurrence of gas explosion under the coal mine, which will undoubtedly greatly increase the safety and risk of mine workers construction operations, at this time, the loss caused is immeasurable, huge, and difficult to compensate. According to literature reports, there are many production safety hazards in coal mine operation, and the more common ones include the occurrence of collective gas poisoning caused by gas explosion or poor ventilation. In this regard, coal mining enterprises must adhere to the safety of life and property of production employees as the first principle of production, to strengthen and optimize the innovation and application of coal mine ventilation technology, through strengthening management to prevent threats and impact on the safety of life and property of production personnel and enterprise economic benefits, so as to improve coal mine operation safety and enterprise benefits.

## 2. Importance of coal mine ventilation safety

For a long time, the research on coal mine ventilation has attracted the attention of many technical researchers, because strengthening the research on coal mine ventilation is conducive to

improving the safety factor of coal mine, which is one of the important production. The efficient application of coal mine ventilation technology plays a very important role in coal mine production. In the process of coal mining, the role of the ventilation system is reflected in two different aspects. First, strengthening the ventilation of coal mines can not only timely discharge the harmful gases under the mirror, but also purify the underground working environment and air, such as: The content of various harmful gases in coal mines is reduced, so it is more conducive to the production and operation personnel to carry out construction, improve the production and operation efficiency, avoid endangering their life and health, and make full preparation for better production in the future [1]. At the same time, whether the ventilation efficiency of the coal mine is high or low will also directly affect the temperature in the mine, when the temperature is maintained within a reasonable range, such as: 20 to 25 degrees Celsius, then it can make the working environment under the mine become more comfortable, when the temperature drops, it can reduce work fatigue, which is conducive to improving the enthusiasm and efficiency of operators, and the mood will become more pleasant. In the process of coal mining and production, because it is deep underground, the operation process is usually accompanied by high temperature environment, and when the temperature is too high, it will directly affect the health of the operator. If the coal mine ventilation system can discharge the hot air in the mine in time, it can create a more comfortable and safe production environment, so as to improve the efficiency of work. Second, strengthening the application of coal mine ventilation technology to fully ensure the safety of personnel, has a very large role, of course, this also includes optimizing the ventilation system to improve the exhaust capacity and efficiency, so as to better promote the production and efficient development of coal mining enterprises..

### **3. Coal Mine ventilation technology and its characteristics**

As we all know, the quality of ventilation equipment directly affects the normal operation of the mine ventilation system to a large extent, especially directly determines the efficiency of the operation of the ventilation system, which is to a large extent one of the most important material basis for ventilation technology [2]. Therefore, for the majority of coal mining enterprises, the ventilation technology and equipment must be updated in real time in the process of production, and the ventilation technology and equipment must be purchased from the regular manufacturers in the process of procurement. Coal mining enterprises in the production process, in addition to focusing on the production of the past, then also timely replacement of ventilation technology equipment, comprehensive testing and regular maintenance of equipment, and then build a complete set of equipment maintenance and management system, has failed equipment, must be timely replacement of increasingly aging and damaged equipment. And some of the equipment with safety hazards are repaired and maintained in time, so as to improve the air quality in the mine, in order to fully ensure the life, health and safety of the mine staff to the maximum extent, so as to continuously promote the normal development of the mine operation, and the production work can be orderly operation.

## **4. Untraced Kalman filter algorithm The safety influencing factors of coal mine ventilation**

### **4.1 The implementation of underground safety management system is insufficient**

At present, many coal mining enterprises neglect the construction of the underground safety management system in the process of coal mine production due to excessive attention to the production economy, resulting in inadequate implementation of various system management, which results in the implementation of some technical management methods is not in place and not scientific enough. This will undoubtedly greatly increase the probability of underground operation safety hazards. In this process, if the technical management personnel in the management of neglect, there are management loopholes, then it will lead to safety risks, if the underground ventilation technology operation is not standardized, not professional enough, then it will lead to low ventilation efficiency, resulting in a large number of harmful gas or gas accumulation, once the

production personnel operation mistakes, resulting in cremation. Then it may cause an explosion accident, or because the underground operation self-rescue method is unreasonable, then it will also directly affect the life and property safety of the production operator.

#### **4.2 Manual operation is not standard**

In the process of carrying out coal mine production operations, the work involved is very complex and arduous, and requires a high degree of concentration and concentration to operate coal mine technology and equipment, the whole can not tolerate any carelessness, if the operation is not professional enough to standardize, then it will easily lead to major underground major safety accidents. This will directly threaten the life and property safety of front-line production workers. Whether the ventilation technology equipment under the mine runs normally and operates in accordance with relevant standards will also affect the safety of underground operations and ventilation. After a long time of operation, underground ventilation equipment will inevitably not appear a certain loss, if the lack of maintenance, then it is easy to cause ventilation technical equipment failure problems, such as: If the ventilation technology equipment is not repaired and maintained in accordance with the relevant regulations, it is more likely to cause safety accidents. This is because the underground working environment is generally harsh. If the operation is carried out in such an environment, it will easily cause equipment failure, so that the ventilation technology equipment can not operate normally. At this time, it will cause the underground ventilation environment to become more and more severe, gas and harmful gases continue to accumulate, once it exceeds the concentration, it will lead to major safety accidents. In the process of designing the ventilation system, if it is not designed according to the underground operation environment, the ventilation capacity will fail to meet the requirements of ventilation and exhaust, resulting in excessive accumulation of gas and harmful gases, poor ventilation, and fresh air outside cannot flow into the mine in time, which cannot meet the needs of underground operations and will increase the resistance of wind flow. As a result, a large number of resources are wasted indefinitely, which will greatly reduce the working efficiency of the mine.

#### **4.3 Weak sense of coal mine operation and management**

If the coal mine operation and management are not paid attention to during the operation of the coal mine, it will lead to the operation of some projects in the process of operation. Therefore, the relevant technical staff must comply with the relevant safety management system in the process of construction. However, on the contrary, due to the heavy work in coal mines, coal mining enterprises have certain negligence in production operations and management, that is, poor safety awareness, until major safety accidents occur in coal mine operations, such as: There is no strengthening of ventilation technology and equipment management, monitoring, etc., which can be seen from many news reports. At present, in the process of underground coal mine operation, many front-line operators often put themselves in danger because of neglect of operation safety, and when the danger comes, it is too late, and finally make their lives and property safety receive a great threat. As we all know, the environment of coal mine operation is very bad, often accompanied by many risks in the process of operation, if the application of coal mine ventilation technology is not in place, without strengthening monitoring, then it will easily cause safety accidents, such as: If the carbon monoxide is heavy, then because the application of ventilation technology is not in place, can not discharge these carbon monoxide in time, it will lead to the continuous increase of carbon monoxide concentration in underground operations, which is likely to lead to severe, coma, and even death of underground operators. In addition, because there is a fault in the ventilation technology and equipment technology and it is not repaired in time, it will affect the failure of underground gas monitoring, and it can not timely understand the underground gas index, content, concentration, etc. If the construction is carried out blindly at this time, it will increase the production safety of front-line operators.

## **5. Optimization management of coal mine ventilation technology**

### **5.1 Pay attention to the management and supervision of coal mine ventilation technology**

In the new era, coal mine enterprises must set up the spirit of development with The Times, pay attention to the safety management of underground coal production and mining, on the one hand should strengthen the management of ventilation technology; On the one hand, the supervision and management of coal mine ventilation should be strengthened. It can effectively improve the efficiency and safety of underground ventilation, so that the ventilation system can be better run, and when the ventilation stability is improved, it can avoid many security threats. Therefore, working technicians should be combined with the actual needs to develop different ventilation management programs, specifically, there are the following programs.

First, the technical personnel in the actual operation management process, should be combined with the needs of production to build a complete set of underground ventilation management system, and then, all management departments must be in accordance with this system to carry out various production work, to meet the requirements of the work, at the same time, there is a major management goal, so that all departments can efficiently carry out various management work. And establish the correct development of coal production management concept and choose a suitable management system, in addition, but also the fine management of normal coal mining and transportation, timely elimination of illegal coal production and mining and illegal underground operations. Among them, at the time when the roadway layout is carried out, the mining and construction personnel should carefully analyze the level of coal and properly protect the coal seam, so as to prevent the occurrence of illegal ventilation operations in coal mines. In the process of carrying out this aspect of construction, the relevant technical staff should be in accordance with the relevant production regulations or legal jurisdiction to carry out production, first, it should be timely before mining and production to find out the gas content, harmful gases, etc., and identify the main parts of these gases, to do a good job in a timely manner underground safety treatment work, so, It can prevent the phenomenon of gas explosion to the maximum extent, or a large number of harmful gas accumulation and damage the health of front-line operators, thus affecting their normal production.

Second, in the process of on-site supervision and construction, relevant technical staff should clarify their work management responsibilities and direction, as well as the work obligations they need to undertake, introduce information technology to deal with underground gas, determine the concentration and content of gas, and provide more technical support for the safety and production of coal mining enterprises. In this production process, working technicians should reasonably use advanced 5G technology to monitor underground operations, analyze that when the gas over-limit power failure is likely to affect the main area, and add a secondary or tertiary power failure system in the key area. All in all, the investigation and analysis of underground gas concentration, content and distribution, as well as the prediction of fire situation, can improve the quality and efficiency of mine ventilation management, and facilitate gas inspection and data analysis at remote ports.

### **5.2 Standardize the work of technical personnel**

At present, the staff of some coal mining enterprises in China have to receive certain professional training before taking up the post, and only after passing the training can they obtain the qualification for taking up the post, and only after passing the examination and obtaining the certificate can they participate in different job duties. However, if you want to really improve the comprehensive quality of the work of the staff, it is completely impossible to rely on pre-job training. Therefore, coal mining enterprises must strengthen the technical assessment and regular training of employees, invite experts in the industry to give lectures and do technical case analysis, so as to help technical employees constantly improve their work ability. Combine the training situation of different technical employees to conduct reasonable group learning, and give different training contents to employees at different levels, such as: Systematic professional course learning and training should be conducted for those old employees who have been employed for a long time, technical analysis reports should be made for them regularly, and some practical operation cases

should be added to deepen their skills and knowledge theory level, while for technical personnel who have been employed for a short time but have rich knowledge and theory, practical case training should be conducted for a period of time, focusing on explaining practical operation skills. Modern teaching equipment and methods can be used to train them in underground ventilation techniques to improve the professional skills and capabilities of technicians, such as: Micro-class explanation method is adopted to deepen their learning ability and improve their knowledge acceptance level by cleverly setting relevant case knowledge content, so that young employees can gain more useful skills and knowledge, understand the functions and advantages of underground ventilation technology management, understand the various risks existing in underground operations, and enhance their understanding of ventilation system technology. Can take the initiative to participate in the work, improve the consciousness, comprehensively improve the comprehensive quality of technical personnel, and promote the production and development of coal mining enterprises.

To a large extent, if you choose a regular manufacturer in the process of purchasing ventilation equipment, you can obtain better technical equipment quality assurance. When purchasing ventilation technology equipment, technical personnel must choose a regular manufacturer, must understand the technical parameters of the equipment, and understand whether the overall operating capacity and performance of the equipment can meet the needs of underground ventilation, and design ventilation technology solutions combined with the different needs of underground operations. For the technical equipment that has been damaged, it is necessary to replace it in time, and carry out repair and maintenance in time, so as to improve the air quality under the mine, reduce the underground gas and all kinds of harmful gases, improve the orderly development of the mine operation, and ensure the safety of the life and property of the front-line operators.

### **5.3 Improve the operation and safety management of managers**

Coal mine enterprise managers must further improve the operation and safety management work, and effectively develop some reasonable management means and methods, the specific management measures are as follows.

First, all the resources, technologies and funds of the enterprise should be used to strengthen the maintenance and management of underground ventilation technology equipment in coal mines, improve the ability of equipment to monitor underground gas, collect various data of underground gas in a timely manner, and follow up in real time. If there is an anomaly, the corresponding ventilation plan should be formulated in a timely manner to discharge underground gas, carbon monoxide and various harmful gases. Avoid damage to the health of front-line workers [3].

Second, clarify the safety responsibility of the management personnel of coal mining enterprises, and investigate the responsibility of the management personnel who neglect their duties and do not pay attention to technical solutions, and give them certain punishment. The technical staff who work seriously and perform their duties should be given certain encouragement and praise, so as to motivate them, and be able to devote themselves to their work in the future, perform their personal work duties conscientiously, and improve their personal work responsibility.

Third, promote the technical safety management mechanism, clarify the work process and methods of the technical management department and the emergency management mechanism, so that different personnel perform their duties, perform their personal work responsibilities, attach importance to their technical safety management work, and require them to perform their work tasks in accordance with relevant rules and regulations to improve work efficiency and quality.

## **6. Conclusion**

To sum up, in the process of coal mine technology optimization management, coal mine enterprises and technical management personnel should sum up their own work experience, do a good job of ventilation technology management based on all aspects of coal mine operation, improve underground ventilation efficiency and management efficiency, so that technical management personnel can achieve reasonable control and improve the awareness of ventilation

safety management. The function and importance of strengthening the optimization management of coal mine ventilation technology are recognized.

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