

Research on Prevention and Control of Geological Disasters in Coal Mining

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Abstract – With the continuous progress of society, China's coal mining enterprises are constantly developing and growing, the related coal mining technology will become more and more complex, the technical content will continue to improve. Due to the continuous improvement of the level of science and technology and the enhancement of economic strength, higher requirements are also put forward for the safety of the coal mine industry. In actual operation, coal mining personnel on the mining technology and its quality requirements will be further improved to ensure that its safety and reliability are fully guaranteed. In order to ensure the smooth progress of coal mining work, it is necessary to do a good job in the prevention and control of coal mine geological disasters. It is of vital significance to study the characteristics of coal mine geological disasters and take effective and reasonable prevention and control measures for promoting social development and meeting people's needs. This paper discusses the unique characteristics of coal mine geological disasters, and puts forward effective treatment plans, at the same time, in the actual operation, coal mine related enterprises also need to adopt practical measures and methods to prevent and control these disasters.

Keywords – Coal Mining, Geological Disaster, Preventive Measure.

I. INTRODUCTION

China is rich in underground coal resources, and the annual output of coal mines is also showing an impressive scale. In view of the huge demand for coal resources in China every year, the state or related enterprises have to carry out large-scale mining to meet the needs of the people. In order to better ensure that the people's living standards are not reduced, we must do a good job in coal mining work, we must strengthen the technology and management of coal mining. Although China's coal mining industry has rich resources and unique advantages, but its internal there are a series of problems, including the imperfect and mature coal mining technology, the relative lag of related technology and equipment, as well as in the coal mining technology management there are many defects. In order to better ensure the safety of coal mine production, certain measures must be taken to improve the efficiency of coal mining work. Therefore, in order to ensure the safe production of coal mines, it is necessary to strictly control the coal mining process, so as to improve the utilization rate of coal resources and promote the development of social economy.

II. THE CHARACTERISTICS OF COAL MINING GEOLOGICAL HAZARDS

2.1. Group Occurrence

In the process of coal mining, the geological environment often suffers a certain degree of damage, and the geological disaster of coal mine is the corresponding feedback of the geological environment to its own damage. Among them, the most common geological disasters are subsidence and landslide, which belong to natural phenomena. It is worth mentioning that the disaster is highly collective, and its occurrence time and region are concentrated in a specific moment or region, rather than isolated occurrence. Therefore, in the development and construction of coal mines, we should pay more attention to it, do a good job in prevention, and avoid inducing

other types of disasters. Due to the wide spread of coal seams, the scale and frequency of natural disasters may further expand, resulting in more disaster events [1].

2.2. The Continuation of Time Shows a Diversified Trend

Coal mine geological disasters, such as gas explosion and roof disasters, often appear sudden, although the occurrence time is relatively short, but its disaster intensity is extremely high, so its destruction is extremely serious; In addition, because most of these disasters are already existed before coal seam mining, the development speed of disasters is fast and the harm is serious. Coal mine geological disasters, such as coal mining collapse and land salinization, tend to last quite a long time, and have gradual and strong characteristics. When studying coal mine geological disasters, it is necessary to take into account their formation conditions and influencing factors, and make comprehensive analysis according to geological structure, hydrogeological conditions and meteorological environment, so as to determine the spatio-temporal distribution law of geological disasters. The diversity of different types of geological disasters leads to their unique characteristics in disaster time.

2.3. Derivativeness

The derivative of coal mine geological disasters refers to the geological disasters that occur in the mining process, which often lead to more simultaneous reactions, resulting in a series of secondary disasters, and even the formation of a causal chain of disasters. Therefore, for coal mine geological disasters, their occurrence has a certain inevitability and regularity, and this is one of the important reasons to induce these accidents. In coal mine geological disasters, the chain reaction brought by the roof disaster includes ground collapse, the formation of ground cracks, the destruction of cultivated land and the further destruction of surface buildings, and also has an impact on surface runoff conditions.

2.4. Inevitable but Defensible

Although China has made certain progress in the prevention and control of geological disasters in coal mines, these problems are difficult to avoid for a long time due to the limitation of scientific and technological level. The main reason is that people do not know enough about the geological conditions of coal mines. However, the occurrence of coal mine geological disasters must follow a certain law and degree, therefore, these disasters must have a certain defensive effect. Therefore, it is necessary to analyze the types of coal mine geological disasters, and put forward the corresponding prevention and control measures, so as to provide people with more safe and effective protection [2].

III. THE CAUSES OF GEOLOGICAL DISASTERS IN COAL MINING

3.1. The Interweaving Effect of Various Factors

There are many factors that cause geological disasters in coal mines. Generally speaking, they are related to the following aspects: First, coal miners do not abide by the relevant systems and standards in the process of coal mining, and do not operate in strict accordance with the relevant requirements. For example, in the coal mine production operation, due to the lack of necessary safety knowledge of the construction personnel, many safety accidents have occurred [3]. In addition, the relevant practitioners fail to effectively and reasonably prevent coal mine disasters, and even fail to formulate appropriate prevention and protection measures. As a

result, the coal mine geological disasters occurred. Some coal mining enterprises in the coal mining, one-sided pursuit of profit and coal output maximization. These companies only pay attention to their own economic interests, even ignore the scientific and safe coal mining, and have an aversion to it, completely ignoring the impact on the geological environment, resulting in the occurrence of geological disasters. At the same time, China's mineral resources are very scarce, so in order to ensure the improvement of people's living standards, it is necessary to increase the development of coal resources, but it ignores the serious impact of geological factors on coal mine production safety. The occurrence of coal mine geological disaster directly stems from the unreasonable mining mode, not strict management and non-standard operation in the process of coal mining.

3.2. Geological Disasters Faced by Coal Mines have Unique Characteristics and Manifestations

There are various features involved in coal mine geological disasters, among which the most prominent feature is its unpredictability. Therefore, for coal mining activities, it itself has a certain risk, and once there is a geological disaster, then the whole mine will not be able to operate normally, and even cause casualties. Because of the sudden and unknown geological disasters in coal mine, there are potential disaster risks in the treatment of mine closure. Therefore, in order to ensure the social and economic development of our country and the improvement of people's living standards, we must strengthen the research on coal mine geological disaster prevention technology, and take reasonable and effective measures to deal with this problem. The main forms of geological disasters include the collapse of the ground, the formation of cracks and the subsidence of the ground. The common mine collapse is a typical geological disaster, which shows certain concealment, and also has some special hazards. Under normal circumstances, the occurrence speed of these disasters is relatively slow, only in a long period of time after the closure of the mine will appear, once it happens, it will cause great threat and harm to the local residents. In order to avoid the recurrence of such accidents, certain measures must be taken to prevent the recurrence of such disasters. After in-depth study, we find that the root cause of such disasters lies in the obvious height difference on the ground when the relevant mining personnel fill the mined coal mines [4].

IV. MEASURES TO PREVENT AND CONTROL GEOLOGICAL DISASTERS IN COAL MINING

Although China has abundant coal resources and relatively objective annual output, there are still some gaps compared with developed countries in terms of coal mining technology and enterprise management level. Because in the actual work, the influence of many factors makes the process of coal mining has many hidden dangers, including the natural geographical environment, geological environment, hydrological conditions, production management and so on. The existence of these unfavorable factors will directly lead to the occurrence of coal mining geological disasters, and its worsening trend will gradually appear. If we do not take effective prevention and management countermeasures to deal with these disasters in time, it is bound to cause huge losses to the whole social and economic development. The severity of geological disasters will not only cause damage to the ecological environment that human beings depend on, but also bring great harm and threat to many aspects of human life safety and property. Therefore, the prevention and control of geological disasters in coal mining can be considered from the following perspectives:

- (1) Strengthen the publicity and education of disasters, improve the public's awareness of disasters and response ability.

In order to prevent and cope with coal mine geological disasters, the relevant departments should attach great importance to the prevention and control of coal mine geological disasters, and strengthen the publicity and education of relevant knowledge to the whole society. Through various educational activities, guide the whole society to understand the importance of disaster prevention, and improve the whole society's awareness and ability of self-rescue after disasters. At the same time, we should actively take various measures to prevent and reduce the possibility and destructiveness of disasters, so that the harm is reduced to a minimum, and ensure that the safety of people's lives and property is not affected. Do a good job in the actual investigation work, so that the relevant staff can deeply study the coal mine geological disasters, grasp the most real situation, in order to better update the method of disaster prevention and control, and guide the people to actively participate in disaster prevention, ensure that they take the initiative to be fully prepared and self-protection, in order to correctly respond to the disaster, the loss caused by the disaster to the minimum [5].

(2) Ensure that the mining of coal mines meets the standard of reasonableness.

In recent years, China has promulgated a series of laws and regulations on coal mining, including the Mineral Resources Law and the Environmental Protection Law, requiring mine owners to strictly abide by and regulate their activities to improve the effectiveness of geological disaster prevention and control and minimize or prevent high-risk behaviors. Attention should also be paid to enhancing the awareness of safety in production and safety, enhancing self-prevention capabilities, and strengthening technical management in daily work to ensure safe and efficient operation of coal mines. The competent mining department should pay full attention to the supervision of coal mining, according to the bearing capacity of the mining area and the actual situation of the surrounding environment, follow the principle of sustainable development, rational mining of coal resources, not just for economic interests, to ensure that the geological environment is effectively protected.

(3) Improve the technical level and production efficiency of coal mining.

Due to the limitation of technical level, China is still faced with many problems in the process of coal mining, which hinder the realization of technical prevention of coal mine geological disasters. In order to improve the efficiency of coal mining in our country and reduce the incidence of safety accidents, we should actively apply new technologies for prevention and control. The use of suitable mine model and mining engineering can effectively avoid underground flood; The use of advanced mining technology and safety measures can improve the recovery rate of coal resources, reduce the waste rate of resources, and improve the economic benefits of coal production enterprises. In the mining process of spontaneous combustion coal seam, in order to ensure the rationality of mining methods, measures should be taken to reduce the existence of coal, and through dense filling or grouting and other means to suppress the phenomenon of spontaneous combustion in coal mines. In addition, according to the difference of geological conditions in different regions, a reasonable mining plan should be selected to reduce the impact of disasters. In the process of coal mining, it is necessary to carry out scientific and reasonable mining area layout, and take effective protective measures to reduce the ore pressure, so as to avoid the risk of coal body cracking or roof falling [6]. In addition, according to the geological conditions of different regions to choose reasonable mining technology, and the use of advanced supporting equipment and technology, so as to ensure the safety of coal mine production. By ensuring the rationality of scale and return air method, the optimization of coal mining method can be realized, so as to improve its level and efficiency.

(4) Establish a comprehensive and complete geological disaster early warning mechanism.

As far as coal mines are concerned, geological disasters occur frequently and are forecast by the state technical department. In order to ensure the safety of mining areas, the State Geological Survey and other relevant units and personnel must strengthen geological investigations, establish a reliable disaster early warning system, make scientific predictions and forecasts based on actual mining conditions, and take targeted measures. Through the continuous improvement of China's coal mine geological disaster prevention awareness and technical level, so that people can live and work more safely. Predicting geological disasters is a long-term and arduous task, and only by doing everything possible to prevent potential risks can we reduce the direct and indirect risks in the places where geological disasters occur.

(5) Strengthen the government's leadership responsibilities and working mechanisms.

Through in-depth study of the basic characteristics of geological disasters, in order to master their distribution laws, so as to effectively delineate the vulnerable areas and dangerous zones, and on this basis, formulate comprehensive prevention and control plans; In view of the hidden danger points of disasters, geological environment investigation is carried out, influencing factors and formation mechanism are analyzed, and treatment plans are proposed. It is an important responsibility of relevant personnel to carry out regular research and inspection, give priority to prevention and realize comprehensive treatment; For different types of geological environmental conditions, the use of appropriate technical means to control, to ensure that disasters can be effectively eliminated in a timely manner, to minimize casualties, property losses and ecological environmental damage and other problems, improve social economic benefits and social benefits [7]. Through the establishment and improvement of geological disaster prevention and control system and implementation agencies, strengthen the administrative management of coal mining to ensure the safety and stability of coal mining; Through the construction of geological disaster early warning mechanism, to ensure the timely and effective control and management of disasters when they occur, so as to monitor the dynamics of geological disasters in real time, it is necessary to build a complete information system, through timely monitoring and forecasting to alleviate the sudden impact and harm caused by geological disasters.

(6) Implement comprehensive prevention and control measures on the basis of considering the actual local situation.

In order to improve the ability to protect and resist geological disasters, strict technical measures should be combined with biological measures in accordance with the laws of the regions where geological disasters occur, so as to achieve comprehensive prevention and control of geological disasters. Therefore, in practice, should be combined with the local topography and geological conditions and other factors to formulate a scientific and reasonable program [8]. With the help of the establishment of rapid rescue teams, timely help in the disaster-stricken areas, in order to minimize the loss caused by disasters. In addition, in the process of emergency rescue should also actively do a good job of publicity and education, so that the disaster-stricken people can correctly understand the seriousness of the disaster. With the close solidarity and mutual assistance between the people of all ethnic groups, we can complete the post-disaster reconstruction work more quickly and efficiently, so as to restore the production vitality of the mining area.

V. CONCLUSIONS

Due to the wide distribution range of China's coal mines, complex geological conditions and other characteristics, it is unreasonable to rely only on unilateral influencing factors to prevent and control measures, in order to ensure the safety of coal mine production and reduce the probability of safety accidents, we need to strengthen the importance of coal mine geological disaster prevention work, from all aspects of the influencing factors to carry on the problem analysis, take effective measures to prevent the occurrence of coal mine geological disasters, with more scientific, effective and reasonable prevention and control measures to actively respond, from the source to solve the coal mine geological problems.

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