

Fire Safety Problems and Safety Measures in Mining Enterprises

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Abstract

The safety production of mining enterprises has always been the focus of social attention. The fire safety management mechanism of mining enterprises, the fire safety awareness of relevant responsible persons and scientific fire safety management means have a very critical impact on the safe production of mining enterprises. This paper discusses the current fire safety problems faced by some mining enterprises, and gives some relevant safety prevention countermeasures according to the problems generated. We hope that the research results of this article can provide some reference for the fire safety management of mining enterprises.

Keywords

Mining Enterprises; Firefighting; Safety Issues; Safety Measures.

1. Introduction

Energy has always been the main driving force of economic development, and mining companies are partly responsible for energy production. With the development of society and the progress of the times, some advanced mining technologies are commonly used in mining enterprises, and the awareness of safety prevention among the responsible persons of enterprises has been improved, so that the frequency of mining disasters has become less and less, and the casualties and economic losses have been gradually reduced. In terms of the current development, the focus of safety management in mining enterprises is mainly on underground operations, but the management of fire safety on the ground is facing greater difficulties. It is worth noting that the low professional quality of some staff and the lack of fire management in the enterprise have led to the frequent occurrence of fire accidents in the production process of mining enterprises, which not only brings huge economic losses to the enterprise, but also endangers the stable development of the national economy and society. Therefore, mining enterprises must improve their own awareness of fire safety and have a complete set of plans to ensure that they can achieve safe production, so as to improve the output value and economic benefits of the enterprise on the basis of safe production.

2. Strengthening the Fire Safety Management of Mining Enterprises is Urgent

There are certain risks in the daily work of mining enterprises, and if the management of fire safety aspects are not implemented sufficiently, this will pose a great threat to the market of the enterprise. Nowadays, people's safety awareness is also increasing, and the significance of fire safety management work in mining enterprises is becoming increasingly significant [1]. On October 30, 2017, a fire occurred at the bottom of a shaft in Dongjiagou iron ore mine in Wu'an City, Hebei Province, China, which resulted in a total of eight workers killed and one seriously injured. When the workers were killed and injured, those responsible not only concealed the facts and did not report them to the government, but also adopted improper solutions, which eventually caused the incident to worsen and had a bad social impact. The occurrence of this incident is sad, which also reflects the

serious lack of awareness of fire safety management in some mining enterprises from the side to cause such a serious result. Therefore, mining enterprises must do a good job of fire safety management, so as to provide workers with a good production workplace.

3. Problems in Fire Safety Management in Mining Enterprises

3.1 Mining Enterprises Do Not Pay Enough Attention to Fire Safety Management

At present, most mining enterprises pay little attention to fire safety management, and the training of staff fire safety is not done properly, which fundamentally leads to serious loopholes in fire safety of enterprises. Whether it is the fire safety management of underground operation or the fire safety management of the ground, the fire emergency effect of many enterprises is not outstanding. This is largely because enterprises focus on economic efficiency, often ignoring the safety issues that seriously affect economic efficiency - fire safety. This leads to problems such as the enterprise's unsound firefighting facilities, incomplete fire safety knowledge of workers and incomplete fire emergency plans. These problems are very deadly, and if a fire occurs during production due to non-compliant operations, then this can result in a tragic cost and even a major safety accident, all of which we do not want to happen.

3.2 Some Electrical Equipment has Serious Safety Hazards

The safety management of electrical equipment in some mining enterprises is not strict enough, which leads to a great safety hazard of electrical equipment. Due to the insufficient safety and fire awareness of some workers, they may use the electrical equipment illegally and connect the wires privately, which will cause the total load of electrical appliances to greatly exceed the capacity of the transformer equipment. Once the accident occurs, the consequences are unimaginable. Moreover, the enterprises do not do the routine maintenance of the lines, which leads to more serious phenomenon of broken lines [2]. There are also some enterprises that do not distinguish between lighting lines and power lines, resulting in critical electrical equipment not being properly grounded and protected and not equipped with fuses, which leads to electrical fire safety accidents. This will cause the personal safety of enterprise workers to be violated, and the enterprise will suffer serious losses.

3.3 Lack of Fire Training for Employees in Enterprises

Most of the fire training work of mining enterprises will be arranged in the safety fire month. Their training methods are mainly in the form of lectures, and mostly in the form of watching videos of fire accidents and fire safety knowledge. The target of their training is limited to employees in special positions and security personnel, which will make the grassroots employees of the enterprises lack corresponding firefighting knowledge. Moreover, the number of fire drills conducted by enterprises is very small, and a considerable part of employees have no general knowledge of first aid in fire accidents, and they do not understand the use of fire extinguishing equipment. The fire safety awareness of some enterprise managers is very weak, and they are not serious enough in the usual fire inspection work, which leads to the fact that many employees have no self-rescue awareness when a fire occurs, thus missing the best opportunity to put out the fire, or even the chance to save their lives.

Most of the employees of mining enterprises are underground mining personnel, their education level is relatively low, most of them have only received basic education, and older rural workers account for a relatively large number. These employees generally lack fire safety awareness and they are not very cooperative with the training on fire safety. As a result, the employees' ability to inspect and remove fire hazards was seriously lacking, resulting in the employees' inability to extinguish initial fires and the employees' low evacuation and escape abilities.

3.4 Inadequate Firefighting Facilities

Since the distance between mining enterprises and cities is relatively far, and most of them are in the mountains, access is not convenient. Therefore, it is difficult for firefighting units to arrive immediately to support the fire, so in the early stage of the fire, only the employees can save

themselves. Most of the building facilities of mining enterprises are seriously lack of fire fighting facilities. Mining enterprises have numerous welding equipment, oxygen tanks, gunpowder, fuses, motor oil and other dangerous items. The fire fighting pool of the enterprise is only used for underground operation and does not take into account the warehouse, distribution room, machine shop, and other places. There are no obvious fire warning signs or safety access signs posted in the department's building facilities. Safety pathways are often closed, which can result in fire extinguisher drive air pressure being lower than the safe value. When a fire occurs, the related rescue work will not be carried out in a timely manner.

3.5 Insufficient Rectification of Enterprises

Some mining enterprises lack reasonable means of fire rectification, and the implementation of rectification work on fire safety hazards is not enough. Often just to cope with the inspection of the relevant departments, only superficial rectification is achieved. Moreover, the inspection work of the relevant departments to the mining enterprises is not timely, and there is a lack of appropriate penalty provisions. Therefore, the enterprise's fire construction work has not been able to effectively achieve.

3.6 Fire Safety Management Mechanism Lacks Binding Force

Some mining enterprises lack complete regulatory process and strict fire safety management mechanism, which leads to an increasingly serious problem of non-compliant operations. Many people in charge of mining enterprises think that they can ensure the fire safety of the mine as long as they purchase and equip suitable fire safety equipment according to the regulations of relevant institutions [3], but they pay no attention to the establishment and implementation of fire safety management mechanisms. This further leads to the weak awareness of fire safety among the grassroots employees. Some enterprises also do not have a clear definition of the production area and living area, so there will be random electrical wiring and modification of power insurance equipment, which poses a serious threat to the fire safety of the enterprise.

3.7 Enterprises Lack Fire Safety Facilities and Buildings are Not Designed with Fire Protection in Mind

In fact, many mining enterprises have the problem of insufficient fire distance between the office building and the place where dangerous goods are placed. Once a fire occurs, this will cause the fire to spread faster, bringing huge casualties and economic losses. Some mining enterprises are not fully equipped with fire-fighting equipment. Some of them only consider the fire-fighting water for underground operation, but not the fire-fighting water for surface operation, so they do not set the corresponding amount of fire-fighting equipment. When there is a fire in the distribution room or the storage room where gunpowder is placed, the lack of sufficient water sources makes it extremely difficult to put out the fire. Some enterprises in the mining process, their piles of mineral resources are too concentrated, and they do not think of the situation of reserving fire escapes, which will bring unimaginable losses once the fire breaks out.

3.8 The Low Professionalism of Some Employees Leads to Irregularities in the Operation of Their Underground Work

Nowadays, the phenomenon of low level of professionalism of employees is common in mining enterprises, and their low education level and older age also lead them to face many difficulties in the process of learning fire safety knowledge. Due to their insufficient knowledge of fire prevention makes them face many safety problems in their work [4]. Some employees will violate the fire safety management regulations and bring dangerous goods into the production area, privately, and some employees do not want to use mining apparatus. The above-mentioned employee disciplinary actions can cause frequent fire safety accidents in the mineral excavation process.

4. Measures to Solve Fire Safety Problems in Mining Enterprises

4.1 Strengthen the Fire Safety Awareness of People in Charge and Build a Scientific and Reasonable Supervision System

The government and relevant departments should strengthen the fire safety training work for the persons in charge of mining enterprises, combine regular training with irregular training, and combine online teaching with on-site lectures, so that the persons in charge of enterprises can fully understand the great significance of fire safety to production. Only when the person in charge of the enterprise can fully understand and be familiar with the fire safety mechanism, fire fighting initiatives and personal escape techniques and other fire safety issues, can the fire safety awareness and skills of the enterprise be truly improved. Mining enterprises must establish a scientific and reasonable fire safety regulatory body, increase the configuration of firefighting equipment and firefighting management personnel, integrate fire safety into the usual production activities of enterprises, and supervise the responsibility for violations that occur in enterprises to truly improve the fire safety of enterprises.

4.2 The Fire Department Needs to Be Strict with the Building, Prompting Companies to Further Improve Fire Safety Facilities

First of all, it is necessary to further strengthen the law enforcement and safety guidance of fire safety for mining enterprises by fire fighting agencies. Firefighting agencies also need to thoroughly investigate the current situation of mining enterprises in their jurisdictions, make reasonable recommendations for rectification where fire safety hazards exist, and guide and support mining enterprises in establishing a safe production environment. At the same time, fire-fighting agencies should also conduct strict inspections of the office buildings of mining enterprises, paying special attention to the locations where key fire safety hazards exist, such as fire prevention intervals, fire pools, fire hydrant configurations and fire escapes in the buildings, and increase the degree of punishment for mining enterprises that do not follow the recommendations for rectification. Second, all mining enterprises should increase investment in their own firefighting equipment. First, actively use high technology and equipment (such as automatic fire alarm, etc.) to improve the fire-fighting function of the mine ground; second, design a scientific and reasonable fire-fighting water supply system. Combine with the actual situation, adopt underground water supply or build underground water supply pool as the fire fighting water supply to prevent the hidden fire hazard in mining operation.

4.3 Enhance the Professionalism of Enterprise Workers and Increase the Training of Their Fire Safety Knowledge

Mining enterprises must focus on developing the professionalism of their employees as well as the operational steps of standardized operations and further increase the training of their employees in fire safety knowledge. This requires employees to master basic fire safety fundamentals so that every employee can recognize the signs of spontaneous combustion in a mining enterprise and extinguish the fire in a timely and effective manner to successfully evacuate themselves. As for the employees operating underground, they must be given special operator training so that they can carry out their operations in a compliant manner. It is only through the continuous growth and improvement of the safety awareness of the employees of the enterprise that the underground operation of the mine can be truly standardized and safe production can be ensured.

4.4 Build the Reasonable Training Assessment System

Mining companies need to further strengthen the training and management of their employees. Through comprehensive and permanent training, the overall quality of front-line employees is improved so that they can master the basic fire safety awareness. Employees engaged in special operations in the mine must be trained and checked in accordance with the relevant national requirements, and if they do not get a certificate, they are not allowed to work [5]. In addition, mining companies should treat fire safety issues on the ground as key issues at the same time as production

safety issues. During the production process, employees should be constantly reminded to pay attention to fire prevention so that their awareness is always awake during the production process.

4.5 Establishment of Fire Safety Management Commissioner System

Mining enterprises should create a fire safety management commissioner system to effectively improve the level of mine operations through dedicated and full-time management. The fire safety management commissioner must be an employee with fire safety knowledge as well as certain management experience, and execute clear management responsibilities in the specific work. According to the actual situation of mining enterprises, divide each fire safety management responsibility area and build a corresponding accountability mechanism.

4.6 Establish Perfect Fire Safety Facilities

Fire safety is a prerequisite for safe production. The fire safety response system of mining enterprises must be established in advance. First, mining enterprises should actively implement the provision of fire safety equipment as well as do regular maintenance work, enterprises need to be equipped with professional staff and professional equipment, and send special personnel to inspect or produce fire to prevent the occurrence of fire. Secondly, it is necessary to increase the control of flammable and combustible materials and ignition sources in the enterprise, and pay attention to the fire safety issues in the mine area as well as to implement fire safety initiatives in non-mining areas to prevent fires from extending to the mine area through other areas. Mining enterprises should increase the funds invested in fire safety and equip all areas with fire fighting water sources and fire fighting equipment in order to ensure the long-term safety of the enterprise with the help of the initial investment of a fixed amount of money. Finally, since mining enterprises are usually established in areas far away from cities, if conditions permit, enterprises should create emergency firefighting teams to ensure that they can be put into firefighting and rescue in time to reduce casualties and economic losses in case of fire.

4.7 Establish the Fire Management Organization

The fire safety management work of mining enterprises involves a lot of contents, so there are many safety hazards in it, so an excellent firefighting team must be suggested. Mining enterprises can also set up a full-time fire department, such as employing full-time firefighters. The mining enterprise needs to be equipped with fire safety facilities such as fire pumps, pipe networks, pools and fire hydrants. This requires professional firefighters to perform regular management and maintenance work on firefighting equipment to see if it is working properly. Fire-fighting equipment and electrical equipment must be left with proper safety spacing in the process of installation, and the wiring must be reasonable to prevent the phenomenon of disorderly connection and pulling, and the grounding protection of the metal shell of electrical equipment must be done in place. This requires the selection of a suitable installation site and the preparation of lightning protection initiatives and overload voltage protection work.

4.8 Enterprises Must Be Clear about Their Responsibilities for Fire Safety

In some companies, when fire safety problems are identified, there is no one in charge and no one who dares to take responsibility. This is precisely because the responsibility for fire safety within the company is not assigned to a clear responsible person. Most employees are so aware that if they reduce their own responsibility, the less responsibility they will have in possible future accidents. For the above situation, companies need to clarify the responsibilities of each employee. For example, a company can divide the employees of the fire management department into three groups. The first group is responsible for promoting fire safety knowledge to the employees of the whole enterprise; the second group is responsible for checking whether there are reasons that can easily cause fire safety accidents during the operation, warning them in time and assisting them in rectification; the third group is responsible for checking whether the fire safety measures of the enterprise and the production area of the mine are perfect and whether the enterprise is equipped with complete fire fighting

equipment. Every employee must be clear about the responsibility they should bear so that the enterprise can fully improve the awareness of fire safety accidents.

4.9 Enterprises Should Archive Past Fire Safety Issues that Arise

In view of the current situation of fire safety accidents in the mining industry, enterprises need to sort out the information on the most recent years of accidents, identify the causes of accidents and use them as a warning. Companies should store such accident data in a special archive so that they can use them as negative examples of fire safety examples to educate their employees so that they can all learn from them. Companies should try to have their employees eliminate the problems that cause fire safety accidents in the early stages.

4.10 Increase Investment in Fire Safety

The enterprise must increase the investment funds in fire management and make long-term fire safety management plan with clear annual and monthly fire management targets. The enterprise can combine the work of old building renovation and fire equipment maintenance with the long-term development of the mining enterprise; secondly, it must actively initiate fire safety activities and publish notices as well as special rectification notices in the mining area in order to create an excellent fire safety atmosphere; finally, for the newly constructed buildings, altered buildings, expanded buildings and other projects in the mining enterprise, the fire safety inspection of these projects must be increased to ensure that the buildings meet the requirements of national fire safety. Focus on dealing with the spacing of gunpowder and fuse placement places, and comprehensive rectification of fire safety evacuation issues, thus enhancing the strength of the mine against fire.

4.11 Use of Modern Science and Technology to Simulate Accidents

With the rapid development of Internet technology today, mining enterprises can also improve their fire safety in fire safety drills through Internet technology. For example, using infrared cameras installed within the enterprise to achieve monitoring of remote and fire-prone locations, or using multimedia technology to conduct fire safety drills in order to achieve fire prevention, fire scene coordination and command, and fire control. Of course, the best use of Internet technology is to assist in simulating accidents by using advanced technology and multimedia technology to simulate the actual situation of fire and escape and rescue before the fire accident occurs. This will allow mine employees to learn and become familiar with fire safety knowledge during the actual drill, in order to reduce the cost of the actual drill and increase the interest of the participating employees, so that they can learn mine fire safety knowledge and become familiar with fire fighting measures during the drill. This can minimize the possibility of fire accidents.

5. Conclusion

In a word, the fire safety of mining enterprises is currently facing a serious problem. To ensure the safe production of enterprises, it is necessary to improve the fire safety awareness of the person in charge of mining enterprises; create effective supervision and management mechanisms; strengthen the professional quality of enterprise employees and increase the training of fire safety knowledge. At the same time, enterprises must also assist the government fire fighting agencies and do a good job of rectifying the relevant fire fighting equipment.

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