

Research on Coal Mine Environmental Pollution and Wastewater Treatment Technology

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Abstract

With the melting of glaciers, the warming of the climate and the destruction of the ozone layer, environmental protection is a growing concern. Environmental protection is a new social condition in order to achieve rapid economic development and a harmonious relationship between man and nature. At this stage, it is also necessary to completely change the traditional development concept and get rid of the thinking of development first and governance later, which seeks higher returns at the expense of ecology. At the same time, the relevant laws, regulations and policies should be used as support, taking into account the ability to enforce national regulations and policies, so that people can truly become an important part of the ecosystem and realise that the safety of the environment cannot be separated from humans.

Keywords

Environmental pollution in coal mines, Waste water treatment, Research

Introduction

In terms of our coal mining resources, our country is with abundant resources and a wide range of species, and as such, coal mining is an important source of energy for the country. However, due to the environmental pollution brought about by coal mining, the large amount of sewage and toxic chemicals produced during coal mining will cause serious pollution to the environment if not properly treated. How to effectively utilise coal mining resources and at the same time reasonably manage the sewage without polluting the environment is an important issue and research topic facing the country today.

1. Environmental pollution and damage from coal mining

1.1 Waste rock pollution

Waste rock pollution is a major pollutant in coal mine production. Solid waste such as rock alleys and gangue are its main sources of pollution. These solid wastes will produce a large number of toxic gases during the burning process, among which sulphur dioxide, carbon monoxide and nitrogen dioxide will have a great impact on the environment; influenced by the regional environment, waste rock in some places, during the burning process, will release a large number of toxic gases, which also contain heavy metals and radioactive substances, once the dirt has come into contact with the surrounding environment and soil, it will pollute the nearby soil and Serious damage to groundwater; serious natural disasters have also occurred in some places, such as gangue collapse and blasting caused by heavy rainfall, posing a great threat to the lives and property safety of local people and causing serious damage to the ecological environment.

1.2 Pollution of the atmosphere

In mines, in addition to the waste pollution described above, there is also gas pollution, which is also very harmful to humans, for example, when the gas enters the atmosphere, it has a great impact on the surrounding environment, and when it en-

ters the human respiratory tract, it can also be harmful to the body [1]. When working in mines, a number of toxic gases are produced. For example, mining in mines requires the use of nitramine explosives, which is a very difficult job that cannot be done by human hands, and nitramine explosives produce toxic gases such as nitrous oxide and nitrogen dioxide. In addition to nitramine explosives, there are also diesel-powered machines which expel harmful gases such as carbon monoxide and nitrogen dioxide. Carbon monoxide and carbon dioxide are also released when coal is burned. To ensure the safety of staff in the working environment, efficient methods are generally used to vent toxic gases from underground mines into the atmosphere. The damage to the environment caused by harmful substances such as methane, carbon monoxide, carbon dioxide and hydrogen sulphide has seriously affected people's normal lives and is also a major cause of accidental production in coal mines.

1.3 Wastewater pollution

Mine water is inevitably discharged during the mining process, with mine water being the main source of pollution, and its discharge can have a significant impact on surface watercourses. The main factor contributing to the turbidity of the water is due to the mixing of impurities such as coal dust and rock dust produced in the mining and transportation of mine water with the coal, thus forming through decomposition and oxidation.

1.4 Surface collapse

Most of the coal mining in our city is underground and mostly long wall mining, where the management of the roof is in the form of collapse, which is more dangerous. The movement, deformation and crumbling of the overburden in the quarry translates into ground collapse, which poses a great danger to the life and health of personnel.

1.5 Noise pollution

Noise is also a form of pollution that can be harmful to the human body and can even lead to neurological deterioration. Studies have shown that the human nervous system will suffer a certain degree of damage when exposed to an environment of 50 decibels or more for a long time. Through the analysis of coal mining process, it can be found that in the process of mining coal resources, a large number of mechanical equipment is used, and this mechanical equipment is one of the main factors in the generation of noise, its decibel exceeds 90 decibels, and even reached 120 decibels.

1.6 Dust pollution

The production of coal mines also produces large amounts of dust, and the severity of dust pollution can be judged by observing the miners, while the environment around the mines, is greatly affected [2]. Dust pollution is not confined to the ground, but is caused by a variety of means. If you pass near a mine, you will find it difficult to breathe and the air quality is poor.

2. Wastewater treatment technology

Mine wastewater contains many substances, such as suspended matter, bacteria, E. coli, emulsified oil, motor oil, manganese and other substances, and after treatment, the turbidity, colour and composition of the wastewater will change. Mine water, if not treated in time, will cause great harm to our environment and water resources, and may even endanger people's normal life. Therefore, the recycling and purification of mine water resources has become an urgent problem. From the actual starting point, due to the relatively late awareness of water resources recycling and purification, environmental protection, and the lack of attention to water resources management, the purification and management of mine water resources is still in the primary stage, and has not yet achieved significant results. The treatment of mine wastewater has not yet attracted sufficient attention, and the recycling of mine wastewater has not been adequately treated. Through the analysis of the current water resources situation, it can be seen that it is currently a critical period of water shortage, if not timely management and reasonable protection of water resources, will cause greater harm to the ecological environment, the human situation will be more difficult, the country's sustainable development will also be hindered. Therefore, the development of water management technology is particularly important. Carrying out research on mine water management technology is the main way and urgent task to solve the development and utilization of coal mine resources [3]. At present, the domestic treatment of coal mine wastewater is still in the groping stage, and the treatment technology adopted is still relatively single, with certain limitations, far from meeting the current requirements. After the mine wastewater has been treated using sedimentation technology, it is graded according to certain criteria and usage, and then re-treated. For example, if the water is used for domestic purposes, it must be chemically treated so that the water resources can be used rationally and also to ensure people's personal safety. Only through effective treatment and technical measures can the rational use of water resources be achieved and the environment protected to a certain extent.

3. Key treatment measures in coal mine wastewater treatment processes

3.1 Pre-settlement tank aeration technology

The chemical composition of coal mine wastewater is very complex, and organic matter is one of them, which can be removed using various methods, the most common of which is aeration and oxidation. Coal mine effluent contains a small amount of oil, mainly from certain machinery and equipment production out, and can be discharged using air flotation technology to meet effluent standards.

3.2 Coagulation and sedimentation

Suspended matter is the main pollutant in coal mine well water and is best managed by coagulation and sedimentation, the main components of which are aluminium and iron salts.

3.3 Sand filter purification

As the coagulation and sedimentation method removes large pieces of suspended material from the mine effluent, there are still small amounts of suspended material and colloids. This means that after coagulation and sedimentation, the water resources have not been fully restored to normal use and must be purified once more. Deep treatment is then carried out with activated carbon. In this process, a mechanical sand filter tank is used, which has the automatic siphoning principle, is very simple to operate, has no special requirements for workers and does not require manual operation.

3.4 Activated carbon adsorption

Through analysis of the composition of coal mine wastewater, it was found that coal mine wastewater is very complex in composition and contains a large number of toxic substances, such as phenol, phenols and other toxic substances, which enter the human body through the skin and mouth, and can cause great harm to human health. Long-term consumption of water containing phenols can lead to denaturation of proteins in the human body and symptoms such as red rash, anaemia and dizziness. Therefore, when coal mine effluent is to be used as domestic water, activated carbon must be used for adsorption.

3.5 Disinfection

As wastewater contains a large number of bacteria, such as coliform bacteria, it can cause serious damage to the skin and lead to skin diseases etc. Therefore, if water from coal mines is to be used as domestic water, scientific and rational disinfection measures should be taken. As an example, chlorine dioxide is an excellent bactericidal agent [4]. Chlorine dioxide is non-toxic, stable, efficient and easy to prepare, and can be produced easily by chemically reacting sodium chloride with chlorine, comparison with chlorine [5]. Chlorine dioxide is particularly powerful as a bactericide, more than five times more powerful than chloride.

4. Conclusion

Coal mines must be developed not just for immediate profit, but with a long-term plan to achieve sustainable economic development and protect the environment at the same time. The old belief that development takes precedence over management does not apply to modern society, with the destruction of the ozone layer, the pollution of the atmosphere and the warming of the climate, many people are thinking about these issues [6]. Our country is very rich in coal mining resources, and while carrying out the development of coal mining resources, attention must be paid to the protection of the environment. In the process of economic development, we must adhere to a scientific and rational view of development, and must firmly believe that happiness does not only belong to the present, but also to future generations. We must develop a set of proven measures to develop coal mining resources when carrying out mining, and truly achieve green and sustainable development. The development of coal mining enterprises will inevitably produce a series of environmental problems [7]. It is important to raise the importance of the psychology and to control every aspect of the process of carrying out the development of coal mining resources to reduce environmental pollution as much as possible and to adopt appropriate treatment methods. This is both a necessity for long-term development and an option for environmental protection.

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