Problems of ensuring security in open – pipe coal mines in the republic of Uzbekistan

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Abstract. This article provides information on ensuring safety at coal mines by analyzing existing coal mining facilities. Information on the Angren coal mine is also given. It is shown that there are no accurate methods for determining the location of fires in order to increase the efficiency of spontaneous combustion prevention by supplying liquid compositions such as water and clay pulp flowing down the formation soil. Measures have been proposed to suppress spontaneous combustion centers, nitrogen is being increasingly used, the supply of which ensures volumetric processing of the collapsed mass and allows reducing the oxygen concentration in the mined-out space.

1 Introduction

The coal industry of the country, integrating a complex of various production processes, is the most dangerous injury not only due to the aging of the mine fund and the deterioration of the mining and geological conditions of coal mining, but also due to violation of the rules for the operation of coal deposits and coal mining technologies [4].

Coal mining has a huge negative impact on the environment, has one of the highest injury rates. One of the dangerous phenomena in the coal mining industry is endogenous fires. Endogenous fires associated with spontaneous combustion of seams pose a great danger to the life and health of miners. In addition, they lead to long shutdowns of mining operations, conservation of coal reserves and, subsequently, to a deterioration in the technical and economic performance of the enterprise.

Operation of obsolete equipment, low level of engineering and technical solutions to ensure production safety, unsatisfactory operational control by the departments of labor protection and safety, violations of the compliance of actual technological parameters with regulatory documents, low technological and production discipline, that is, the lack of a system for ensuring effective preventive measures development of industrial hazards, contributes to the manifestation and implementation of the latter, leading to accidents, explosions, fires, occupational diseases, injury, death of people and the failure of the cut for a long time. Therefore, the study of the causes and the development of preventive measures to reduce the fire hazard of coal seams is a very urgent task [1].

2 Experimental research

Insufficient knowledge of the mechanism for the implementation of industrial hazards and causes, the lack of a systematic analysis of the determining factors and causes, comprehensive criteria for the quantitative assessment of industrial hazards, workable methods for predicting the level of safety at the design stage and organization of production makes it difficult to develop and implement measures that ensure the effectiveness of decisions taken to minimize the level accident and injury rates in coal mines and cuts.

Based on the foregoing, it can be argued that scientific research in the direction of developing a system for ensuring the safety of the main production processes when performing mining operations in a coal mine is very relevant. And also relevant is the establishment of patterns of influence of a complex of mining-geological and technological factors on the characteristics of industrial hazard for the development of a system for ensuring the safety of the main production processes during mining operations, which allows developing measures to effectively reduce injuries in coal mines.

It must be said that virtually all mining enterprises produce dust, not only coal mines or coal transportation and transshipment facilities. Just black dust is the most common and most noticeable. The task of dust suppression is a common one for many industrial companies [2].

The idea of the work is to comprehensively take into account the mining and geological conditions and technological parameters of production when predicting the level of industrial hazard in order to make decisions.
that reduce the likelihood of injury (risk) for miners in the main professions.

![Fig. 1. Coal excavation for vehicles.](image1)

Therefore, it is necessary to take appropriate measures to reduce the negative impact of the coal mining process on the environment and nearby settlements by adopting environmental technologies to prevent the formation of coal dust and flue gases from coal fires.

When coal is transported by large dump trucks of the Belaz type, a huge amount of dust also rises into the air, which can be extinguished by adding special pastes to the road soil.

![Fig. 2. General view of the Angren section.](image2)

As can be seen from the figure, the section has a huge territory. During open-pit coal mining, collapses, landslides, formation of cracks and destruction in the walls of the deposit are possible due to a violation of the mining technology.

![Fig 3. Extraction of a thick coal seam.](image3)

Such undesirable phenomena in a coal mine can be constant causes of various accidents, accompanying the appearance of injury among the working personnel of the mine.

![Fig 4. Standard rules for technical operation of mineral resources deposits during open-open mining.](image4)

Therefore, we have set the goal of analyzing and monitoring cases of accidents and gross violations of the relevant established coal mining technologies, which in turn attract casualties and injuries among the working personnel, as well as developing special measures and measures to ensure the safety of the coal mining process.
3 Research results

The Angren coal deposit is a brown coal deposit in the Akhangaron valley of the Tashkent region, located at the foot of the Kurama and Chatkal mountains. Exploration work began in 1934. The first mine was built in 1940, which was launched the same year. The coal basin covers about 70 km². Proved reserves are estimated at 1.9 billion tons. Located between the Jurassic deposits, the formation is very loose, with a thickness of 20 m at the surface and 130 m at depth. Coal belongs to brand B2. Calorific value 13.9 MJ/kg. Coal is mined mainly by open pit mining. In addition, at the “Erostigas” station, coal is processed into combustible gas by coal gasification. Along with coal, kaolin is also mined. Portland cement, flux, shoulder and many rocks are laid between the layers, which can be used for the production of sewer pipes. More than 85% of the total coal produced in Uzbekistan comes from the Angren coal mine.

However, there are a number of problems with coal mining. The most important of these is environmental pollution. When coal is mined, especially in an open pit, a large amount of waste rock is formed in the form of coal dust and artificial embankments. Tailings of coal in dumps sometimes ignite spontaneously, while the atmospheric air is charged with flue gases. In addition, when coal is transported by heavy dump trucks of the Belaz type, a large amount of coal and soil dust rises into the atmospheric air. All this negatively affects the environment and the health of workers, as well as the nearby communities.

![Fig 5. Open pit mining.](image)

In order to identify the highest risk HIFs, territories and industries, a classifier of the degree of accident risk has been developed using the developed risk-oriented indicators and criteria for categorizing HIFs given in table 1.

![Fig 7. Bench working area: 1-drill rig, 2-vehicles, 3-excavator, 4-blasted rock.](image)

**Table 1. Criteria for the degree of danger of accidents at on-site (on-site) hazardous production facilities**

<table>
<thead>
<tr>
<th>Comparative degree of danger of an accident at a component of a hazardous facility</th>
<th>The maximum possible number of victims whose life or health may be harmed as a result of an accident at the facility or component of the educational program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>Less - 10</td>
</tr>
<tr>
<td>Average</td>
<td>10-74</td>
</tr>
<tr>
<td>High</td>
<td>75-300</td>
</tr>
<tr>
<td>Extremely high</td>
<td>More - 300</td>
</tr>
</tbody>
</table>

To establish the hazard category of a production facility based on the level of accident risk, the hazard indicators calculated for hazardous production facilities are compared with the general criteria for categorizing emergency hazards. The upper values of the ranges of accident hazard indicators at hazardous production facilities with a high accident risk (Table 1) characterize the possibility of major accidents, and at hazardous production facilities with an extremely high accident risk, especially large accidents [3]

**Dust suppression methods in quarries.** The production process of open-cut coal mining is associated with a high level of occupational risk, which is formed mainly due to the intense inhalation exposure to coal dust against the backdrop of an unfavorable microclimate [8]. Dust control in mining operations includes dust prevention, dust suppression and dust collection. If it is impossible to completely exclude dust formation, along with dust collection at mining enterprises, in various technological processes, dust suppression of dust in the atmosphere (coagulation) and deposition directly at the places of dust formation, as well as dedusting (artificial) ventilation - liquefaction and removal of a dust cloud are widely used [7].

Technical measures do not always provide a full-fledged healthy dust environment in the workplace (reduction of dust content in the air to maximum permissible concentrations), in such cases it is
mandatory to use personal respiratory protection equipment.

However, many coal mines and cuts operate in regions with a high temperature regime. In this regard, at these enterprises it is necessary to use special personal protective equipment that takes into account the negative ambient temperature.

4 Conclusion

Thus, it has been established that unfavorable labor factors at mining facilities include: sharply changing temperatures of air and rocks; high humidity; often - high speeds of air movement along the main workings; dust, explosive and exhaust gases; noise, vibration, souffle emissions of toxic gases; increased risk of injury and the development of occupational diseases. Dust remains the main unfavorable professional factor at the majority of mining facilities in the North, the concentration of which depends on the development technology, type of mineral, equipment used, production operation, and implementation of anti-dust measures.

In each case, these issues are resolved individually. The set of measures to reduce the factors of the working environment affecting miners should include the use of personal protective equipment. However, it must be understood that they are not able to replace the use of radical and complex technical measures to combat dust, such as dust collection and dust suppression.

References