JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
GERMAN INTERNATIONAL JOURNALS COMPANY
ISSN: 2751-4390
IMPACT FACTOR (RESEARCH BIB) : 9,08. Academic reserach index

ANALYSIS AND ASSESSMENT OF FIRE RISKS AT COAL ENTERPRISES AND MEASURES TO PREVENT THEM

F.D.Yusupkhodjaeva

Doctoral candidate, Department of Life Safety

Tashkent State Technical University,

Tashkent, Uzbekistan

G.M.Gulomova

(PhD), Associate Professor, Department of Life Safety;

Tashkent State Technical University,

gulyamova_gulnora433@gmail.c

Abstract: This article provides a deep analysis and assessment of possible fire risks arising in coal mining, as well as methods for their control and measures for their prevention. Also, the work studies the features of fire risks at coal enterprises.

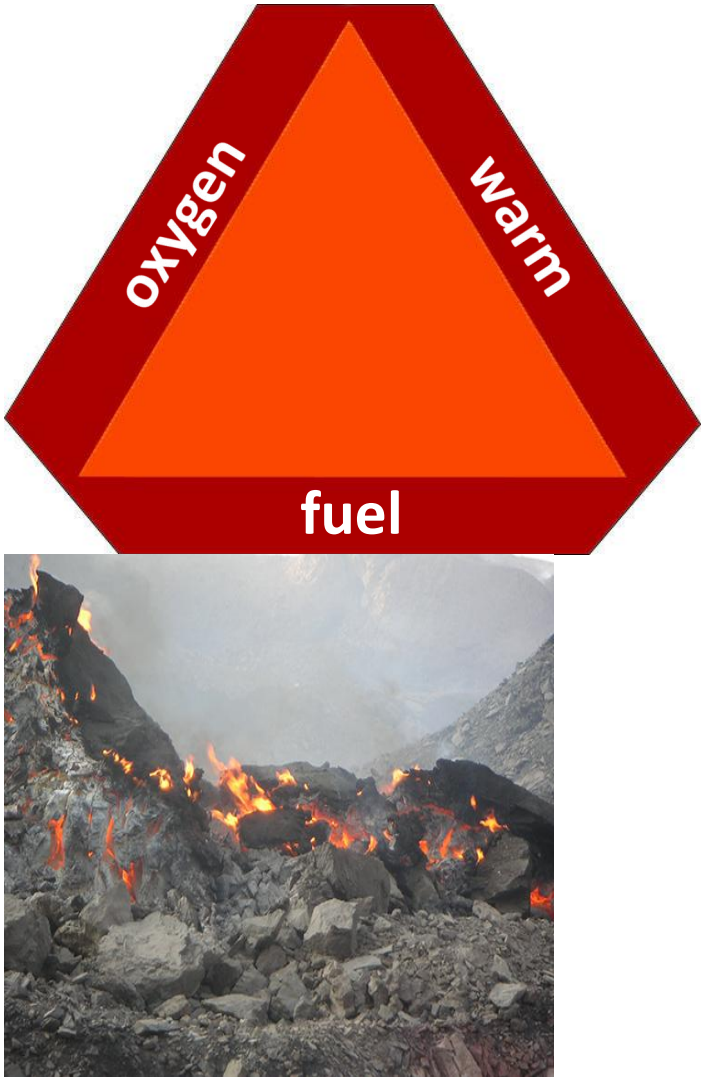
Keywords: coal industry, carbon, risk, mines, brown coal, hard coal, fire safety.

Introduction. Fire safety is one of the most important components of coal mining operations. The coal industry is characterized by increased risks of fires due to the specifics of working with coal, high temperatures at some stages of processing and mining, and the presence of flammable materials. Assessment and analysis of fire risks, as well as timely measures to prevent them, are key factors contributing to reducing the number of emergencies and ensuring the safety of workers and the environment.

Currently, there is a significant number of normative-technical and normative-legal documents in the territory of the Republic of Uzbekistan that regulate the assessment of fire risks and describe the methods for their determination at industrial facilities, including in the mining industry. When assessing the compliance of a production facility with security, the parameters, risks and other criteria are examined according to departmental regulatory documents adopted by state executive authorities.

Coal mining and coal processing enterprises have their own specific features in design, construction, operation, and also assessment of the level of fire safety of existing coal enterprises. Coal industry enterprises are subject to increased requirements for labor protection, industrial and fire safety. Most of the structures of coal industry enterprises were erected before the adoption of current methods for assessing fire risks at production facilities and buildings of various functional purposes. This does not allow a full assessment of the actual condition of the facility in accordance with modern coal industry safety requirements, which leads to an increase in individual and social fire risk. Moral and physical deterioration of equipment and structures used also has a detrimental effect on the overall level of labor protection, fire and industrial safety.

A comprehensive fire hazard assessment is the first step in developing a fire protection plan and reducing the risk of death and damage from fire. Fire hazards vary between surface and underground mines and are dependent on the size, structure, materials, equipment and number of personnel in the mine. Engaging a fire safety expert to carry out a detailed risk assessment can reduce the likelihood of hazards being overlooked inadvertently.



Picture 1. Triangle of causes of fire in a mine

Although risk factors vary from site to site, common fire hazards may include mobile equipment, mining rigs, welding and cutting operations, and storage of flammable and combustible liquids (oils, greases, diesel and hydraulic fuels). Mined resources such as coal, coal dust and methane also increase the risk of fire.

Features of fire risks at coal enterprises

1. Ignition of coal dust and gases. One of the main sources of fires at coal enterprises is coal dust, which, when released into the air, can form explosive mixtures. Particularly dangerous are areas where coal is mined, as well as areas where it is processed. Coal dust, at certain concentrations and conditions (temperature, humidity, presence of ignition sources), can cause a fire or even an

explosion.

2. High temperatures in technological processes. During coal mining, processing and transportation, heating of materials may occur, which, in combination with insufficient ventilation and a poor cooling system, creates conditions for ignition.

3. Improper storage and transportation of coal. If coal is not stored in designated places or is stacked incorrectly, this may create a risk of fire. It is important to consider that during storage, coal may spontaneously ignite if the temperature and humidity conditions are not correct.

4. Equipment and wiring. Excessive load on electrical equipment, improper use or poor technical condition can lead to short circuits and fires. It is especially important to properly follow the rules for operating electrical installations, which are often a source of potential hazards at coal enterprises.

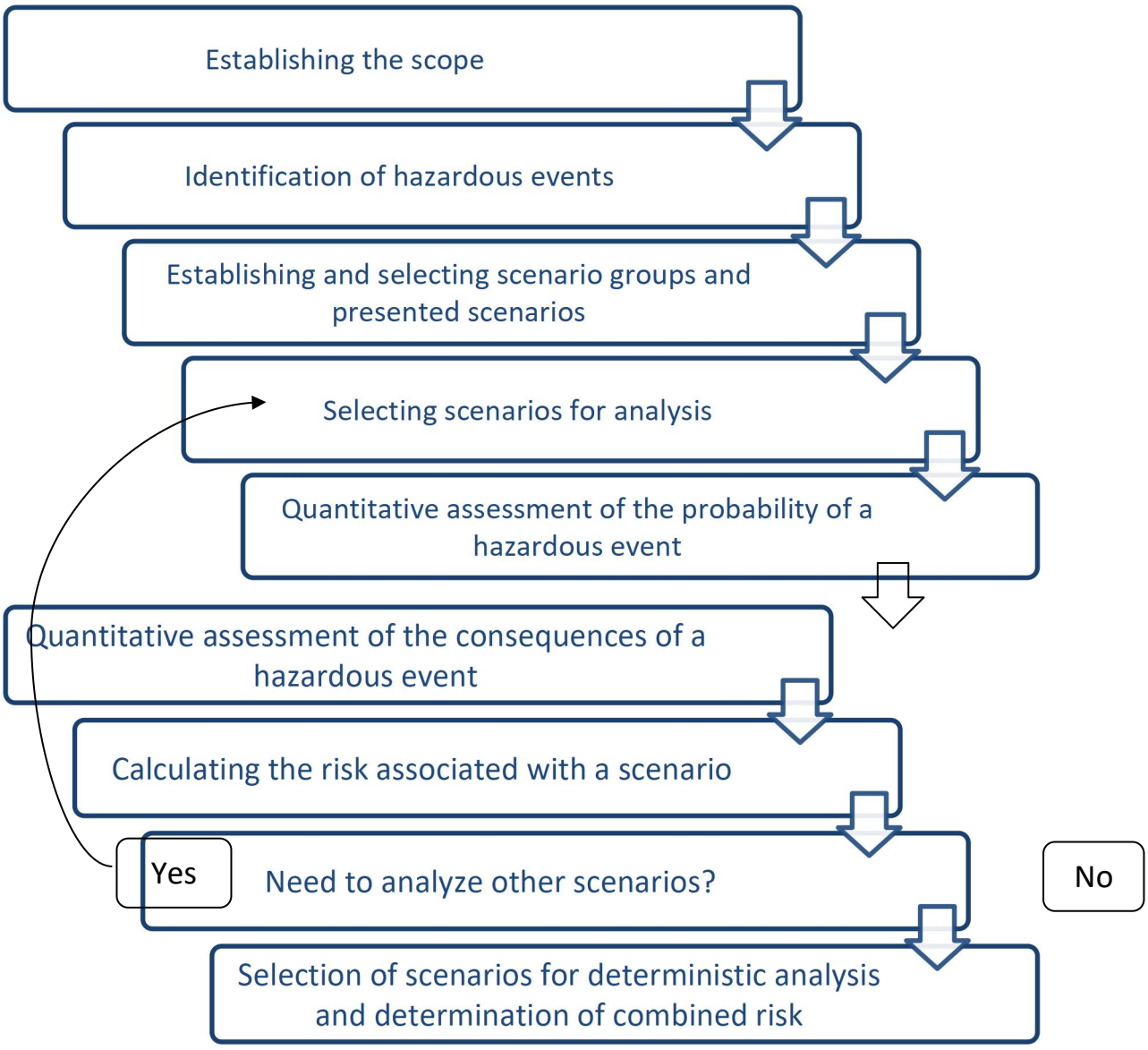


Table 1. Fire risk assessment scheme

Fire risk assessment at coal enterprises includes several key stages:

1. Identification of sources of danger. At this stage, a detailed inspection and analysis of all technological processes, equipment and potential fire zones is carried out. It is important to identify places where coal dust may accumulate, as well as to establish the presence of potential fire sources.

2. Assessing the probability of a fire. For each threat, an assessment of the probability of its occurrence is made. This task is solved based on an analysis of historical data on incidents at similar enterprises, as well as taking into account the specifics of the work of a particular facility.

3. Assessing the consequences. After identifying possible sources of fires and assessing the probability of their occurrence, it is necessary to assess the possible consequences, such as material damage, possible human casualties, and damage to the environment.

4. Development and implementation of a risk management system. Based on the assessment, measures are developed to reduce the risk of fires, including changes in technology, equipment, organizational processes and personnel training.

Coal mining fires can have catastrophic consequences for both workers and the environment. Therefore, preventing coal mining fires requires a comprehensive approach and the use of various safety measures.

1. Fire-fighting technologies and equipment. Modern coal mining enterprises use various technologies and equipment to prevent and extinguish fires. One of the most effective methods is the use of automatic fire extinguishing systems, which are installed in places with increased fire hazard. These can be either powder or water systems, which can effectively extinguish a fire in the shortest possible time.

Particular attention is paid to the ventilation systems of mines. Incorrectly adjusted ventilation can lead to the accumulation of coal dust, which is one of the main risk factors for fires. Modern ventilation systems are equipped with sensors that record the concentration of methane and coal dust, and can automatically shut off the air supply if the level of hazardous substances increases.

2. Monitoring the condition of rocks and coal seams. One of the risk factors for fires is coal itself, which can spontaneously ignite under certain conditions. This is due to coal oxidation processes that can occur under conditions of high temperature and humidity. To prevent spontaneous combustion of coal, regular monitoring of the condition of coal seams is carried out, especially in those areas where there is a risk of high temperatures.

Special methods are also used to stabilize coal seams, such as cooling them or using chemical compounds to suppress oxidation processes.

3. Employee training and safety drills. One of the key factors in preventing fires is the qualification and awareness of workers. Coal mining companies regularly conduct training and education of employees on fire safety. Workers are taught how to act correctly in the event of a fire, what personal protective equipment to use and how to evacuate safely.

Particular attention is paid to training in the proper handling of flammable substances and equipment. Employees must know how to use fire-fighting equipment, such as fire extinguishers, and how to prevent the use of fire in hazardous areas.

4. Planning and organizing safety at work. It is important that each coal mining enterprise has a clear plan of action in the event of a fire. This plan includes not only the organization of fire extinguishing, but also the evacuation of personnel, as well as methods for rescuing people in the event of smoke. На шахтах устанавливаются аварийные выходы, которые должны быть доступны и в случае обрушения туннелей. Важно также предусмотреть средства связи,

чтобы в случае чрезвычайной ситуации работники могли быстро сообщить о возникшей угрозе.

In addition, preventive measures aimed at identifying potential fire hazards are regularly carried out at the production facility, such as regular inspections of equipment, ventilation systems, and monitoring the condition of mine shafts.

5. Use environmentally friendly methods of coal mining. One of the important aspects of preventing fires in coal mining is environmental safety. Modern coal mining methods are aimed at minimizing the impact on the environment, including the use of technologies that reduce the likelihood of fires.

One of these methods is deep coal processing, which allows minimizing residual coal dust and emissions of hazardous substances into the atmosphere. Technologies for the disposal of coal ash and waste are also actively developing, which reduces the risk of fires in waste disposal sites.

Coal enterprises must be equipped with modern fire protection systems, such as automatic extinguishing systems and installations for monitoring the condition of objects. The use of gas and water extinguishing systems, as well as sensors for detecting the first signs of fire, helps to promptly respond to incidents and minimize sources of ignition must be regularly checked and maintained. This helps to avoid short circuits and other emergency situations that may lead to fire. A key aspect of fire prevention is employee safety training. Personnel should be trained in the correct actions to take in the event of a fire and undergo regular emergency drills. It is necessary to strictly comply with current regulations, safety standards and operating instructions for equipment and premises. Regular audits and monitoring of compliance with these standards will help reduce the risk of fires.

Conclusion. Analysis and assessment of fire risks at coal enterprises requires a comprehensive approach, including both technical and organizational measures. Fire safety in the coal industry is not only compliance with standards and the implementation of modern safety systems, but also the creation of a safety culture among the enterprise's employees. A thorough risk assessment and timely measures to prevent them help minimize the consequences of potential emergencies and ensure safety for both workers and the environment.

Fire prevention in coal mining is a multifaceted task that requires a comprehensive approach. This requires modern technologies, competent planning, regular training and a high level of employee qualifications. Only by taking all these factors into account can the risk of fires be reduced and safe working conditions at coal mining enterprises be ensured.

In conclusion, it can be noted that the analysis and assessment of fire safety in coal mining play a key role in preventing accidents and ensuring worker safety. The coal mining industry faces a number of specific risks, such as spontaneous combustion of coal, the presence of methane and dust, which requires special attention to technical and organizational measures. An effective monitoring system, regular equipment inspections, strict regulations and personnel training are all necessary to minimize fire safety hazards. It is important that all stages of coal mining are accompanied by a comprehensive approach to safety issues, which will ensure protection not only for workers but also for the environment.

List of used literature:

1. Gulomova G.M., Aripxodjaeva M.B., Abdurakhmonov E.B. Types, properties, characteristics of activated carbon and obtaining samples of granular activated carbons using composite binders. Technical science and innovation Journal. Tashkent, 2021. 61-66 p.

2. G.M.Gulomova, M.N.Musaev, Problems of Ensuring Safety at Open Pits in the Republic of Uzbekistan. JournalNX, 2020-314p.

3. D.Rakhmatova, M.Musaev, G.Gulomova, M.Aripkhadzhaeva, D.Nizamova, Development of safe products from local waste of oil and fat production // E3S Web of Conferences, 371, (2023).

4. Gulomova G.M., Faizullaev O.T. Innovative Development in Educational Activities journal. Ensuring safety at open-pit coal mines in the Republic of Uzbekistan. Vol.1 No.2 (2022). August, ISSN:2181-3523.

5. G.M. Gulomova, H. Ernazarova, O.T. Fayzullaev. Risk assessment and analysis of emergency situations at hazardous production facilities. Konchilik mashinalari va tekhnologialari. Magazine №4 (10), 2024-51s. ISSN 2181-3442.

6. Forsyuk A.A., Erokhin S.Yu., Zakharov A.L. Methodology for assessing the level of potential danger of newly developed mining equipment and technologies.-Catalog of scientific and technical developments.-M.: MGI, 1991, issue 2.-P.21.308.

7. G.M. Gulomova, O.T. Fayzullaev, A.B.Jumanazarov, F.D.Yusupxodjayeva. Energy and resource saving problems associated with the adsorption of petroleum products// Problems of energy and resource saving. Journal (No. 87), T.:-2024, 420-427s.

8. Gulomova G.M. Theoretical and practical aspects of the study of Angren coal for obtaining sorbents// International Conference of Academic Sciences, Novosibirsk 2021, pp. 92-97.