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UNIVERSITATEA DIN
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CERTIFICATE OF PARTICIPATION

National University of Water and Environmental Engineering

This certificate is presented to

VU TRUNG TIEN

HANOI UNIVERSITY OF MINING AND GEOLOGY, VIETNAM

for attending

the VI International Scientific and Technical Conference "Innovative Development of Resource-Saving Technologies and Sustainable use of Natural Resources"
Petroșani, Romania on November 16, 2023

Rector University of Petroșani, Romania
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6rd INTERNATIONAL SCIENTIFIC AND TECHNICAL CONFERENCE

"INNOVATIVE DEVELOPMENT OF RESOURCE-SAVING TECHNOLOGIES AND SUSTAINABLE USE OF NATURAL RESOURCES"

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THE CONTROL SOLUTION FOR WEAK ROOF IN THE FULLY MECHANIZED MINING LONGWALLS IN QUANGNINH COALFIELD, VIETNAM

The phenomenon of roof falling of the weak roof rock in the fully mechanized longwall is one of the main reasons affecting on the safety and efficiency of longwall mining process. Therefore, the analysis of causes for the phenomenon of roof falling in order to find out the proper preventive solutions, strengthen the roof control, reduce the falling roof accidents is very essential.

Regarding to the real issues in the work of coal mining and work of roof control, the authors researched and analyzed the main reasons leading to collapse of the roof rock near the face in the fully mechanized longwall and proposed solutions to prevent roof, contribute to the management and control of the weak roof rock reasonably.

The basic of controlling roof rock in the fully mechanized longwall is to control and protect the roof rock near a longwall face, because the roof rock near the longwall face above shield, basically it is not supporting area and the roof rock area are cracked, soft rock which belongs to the roof rock which are controlled in the mining longwall. At the area, combining just has moved past to mining in the immediate the roof rock are exposed and strain state also changed dramatically. However the shield has not moved forward promptly to support the roof rock here. If the roof rock in the area is type of soft and loose rock, it will tend to fall in space of the longwall, there will have the roof convergence. This issue causes the failures in the longwall and many difficulties of support works even though it may cause of the accident to the work.

During the coal mining process at the longwall faces, the roof rock is exposed immediately, at the same time the stress state here also changes drastically. But now, the shield still has not timely moved forward to hold roof rock near to the face. If it is weak and loose rock, it tends to fall to

space in the face, this problem can cause accidents in the face, besides it causes difficult to the holding work and unsafe for people working in mine.

Factors affecting the roof falling phenomenon in the longwall

+ *Factors of geology*

The geological factors such as folds, faults, fissures, cracks of coal and rock, strength of coal and rock etc. They are the factors affecting the stability of the roof rock. During the coal mining process at the longwall faces, structural dynamics of initial stability rock and coal are destroyed, the strain of the roof rock through coal seam to the floor rock. If coal is soft and breakable, the strain will fully transfer to the floor rock, leading to the roof rocks crumbling. The crevices and density of crack are the main factors determining the strength of the block rock. the crevices and cracks are more increasable, character of rock is more weakly and the strength of the rock is decreased, which makes the rock easily collapse. The geological fractures such as folds, faults, are easily formed. The rocks which are crumbled, easily to collapse. The angle between a longwall and the crumble of rock area issmaller, exposure area of the crumble of rock is larger that may result on the increase of the roof falling phenomenon to the longwall mining. The crevices and cracks are similar characters of rock swelling. The roof rock is weaker, the roof falling phenomenon is more sharply [1-3].

+ *The width exposure of the roof rock* [4]

After the shearer has cut coal, the roof is exposed. If the shield does not move in time to support the roof or during the move, the shield does not lower to the required level but still makes certain contact with the roof, reducing the support quality of the shield. The distance from the shield to the longwall face exceeds the specified value, which causes the exposed distance of the roof to be large, and then leads to the hanging time exceeding the specified time limit. The working load and initial holding force of the shield do not reach the specified value, or the mining height is greater than the maximum support height of the shield, resulting in pressure on a large area concentrated on the roof, which causes the roof to bend and creates problems with the phenomenon of face spall and roof falling.

During the coal mining process at the longwall faces, the roof rock is exposed. The width of exposure of the roof rock is larger, degree of collapse is higher.

In fact, the mining process shows that in case of distance exposure of the roof rock is zero (beam was closer to the longwall face) but the roof falling phenomenon still happened. The demonstration shows that the distance exposure of the roof rock is not the only the factor affecting the roof falling phenomenon which also involves many other factors.

+ *Initial support load of shield* [5]

During the operation of the shield, it is necessary to adjust the average working load of the shield to a reasonable level, which can reduce the problem of roof falling of the roof. In order to ensure the supporting load of the shield, it is necessary to first determine the initial support load of

the shield, but in fact, it is shown that the reasonable ratio of the initial supporting load of the shield is to be determined only about 70% on average, due to the following main reasons:

- the time to supply lubricant to the shield is short, the initial support load has not been achieved but the lubricant has stopped pumping;

- the pressure of the pump station is not enough, the valve and the pipeline are leaking;

- the floor is soft and weak.

The control methods for the weak and loose roof [6-8].

+ *Selection of reasonable shield*

The roof rock is instable, we selected beam of shield with the function of telescopic. During the coal mining process, we need to move shield closer to the longwall face following movement of the coal cutting shearer, support the roof rock after that it is exposed concurrently to pull beam forward, ensuring the smallest distance from the face to the beam. If the face is failed, it can be moved the beams to location of the face failures, immediately support before. This is also effective in the management of the weak and loose roof.

+ *Spread out steel grating under roof rock*

The weak and loose roof above the beam of the shield are crumble. Therefore, forming unstable rock layers with different thickness above the beam. So, when pulling the shield, this rock layers can fall down the gap between beam and the face which lead to the roof convergence phenomena on the increase. When spreading out the steel grating under roof rock, this makes the weak and loose roof from rock layer stable. Improving the support of the roof rock. Normally, spreading out the steel grating, two layers for managing roof rock have the advantages:

- Effective prevention on the roof rocks falling on among distance from the shield to the face. While improving the state's exposed roof rock and beams of shield.

- Effective improving the average load of the shield and rock hardness

- Effective for the prevention of the roof convergence phenomena, reducing the depth of the roof convergence phenomena.

+ *Adjusting and moving the shield closer with roof rock*

With the weak, loose and unstable roof lowering and moving the shield is normally very difficult. This time is necessary to apply the method to move the shield closed to the face. (when moving the shield, firstly starting the hydraulic jack, then gradually unloading to make loads of beams and roof rock certain ensure, then movinge the shield). Thus, the roof rock can’t appear the phenomenon of sudden instability. it will not only be effective roof control but also the shield move fast, reducing time of the hollow roof.

+ *Build up valve to ensure the initial load of the shield*

When workers perform movements of the shield, to improve movement speed, normally, the time to feed liquid for the shield must be short. Strength of initial shield is not enough so it is re-

quired to build valve to ensure the shield to continue the pressurization until achieving the strength of initial shield.

Conclusion

In the fully mechanized longwall with the weak roof rock, the roof control is fine, which lead to the decrease on effective work of equipment in the longwall and even threaten the safety conditions of workers. The authors summarize some of the actual production methods to handle the problem. This may be effective in the longwall mining with the weak roof rock.

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SOME FUNCTIONAL FEATURES OF THE USE DRILLING FLUIDS DURING THE CONSTRUCTION OF WELLS

If we do not take into account some exceptions, we can say the following. The process of drilling wells cannot be carried out without circulation of drilling fluids [1]. The purpose of drilling fluids is varied. Drilling fluids help reduce the hardness of rocks at the bottom of the well. They cool the rock cutting tool and bring the destroyed rock to the surface. Drilling fluids are the hydraulic power source for downhole motors. The presence of special substances in drilling fluids helps reduce power costs, which is associated with overcoming friction forces in the well. Further development of drilling technology requires the development and implementation of the latest well flushing techniques and drilling fluids formulations. In most cases, they allow you to avoid serious compli-