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Professional paper

EFFECT OF THE FORM OF AN UNDERGROUND OPENING AND TYPES OF SUPPORT MACHINE UTILIZATION FOR CONSTRUCTION OF UNDERGROUND SPACES IN THE COAL MINES

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Abstract: In JP PEU mines, primarily in the mines "Lubnica", "Soko" and "Rembas, designed to open new mining fields and ditches, where the total length of projected space about 26000 m. The most common form of cross-section is a circular underground chambers (66%), a suburb steel circular permissive diameter $\phi = 3.5$ m, with a light cross-sectional area of 9.62 m².
What would be designed premises for drilling-only demolition will result in significant delays in opening new production facilities, it is necessary to consider the possibility of mechanized construction of underground spaces.
Introduction of mechanized construction of underground spaces in the mines JP PEU, it becomes a question of justification of the current forms of underground rooms and type of support. One of the alternative proposal is that instead of a circular underground room used arched form, and instead of circular steel roof supports, to use the combined support. Mixed-timbering in this case includes a built-in steel support on a larger axial distance in combination with anchors that are installed between the steel support frame.
Based on the above proposals, in this paper deals with the influence of the shape of underground facilities and the types of support on the use of machines for underground coal mines.

Key words: shape of the underground rooms, support, mine, machine, coal

1. INTRODUCTION

Underground rooms in the coal mines are produced in different environments. The most abundant of the working environment are: coal, coal (clay, sandy clay, clay-marl, marl, etc.).

The most common forms of cross-section of underground chambers are trapezoidal (10%), arch (24%) and circular (66%). The most abundant types of support for supporting the underground facilities are: Steel Circular (66%), steel arch (23%), wooden trapezoidal (10%) and other types of support (1%).

The most common cross-sectional size of the underground rooms are making room for a circular cross section 9.62 m^2 and 12.56 m^2, with production facilities arc

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cross-section 8.6 m^2 and 10.75 m^2 of production facilities and trapezoidal cross-section of 7.5 m^2 and 8.6 m^2.

As previously stated 66% of the underground rooms are made in a circular shape cross section, and supporting steel circular permissive support. The current way of supporting affects the speed of production facilities, a common way of making the repair (rehabilitation) underground rooms. This, in addition to methods of production, imposes the question of the feasibility of supporting the current way.

In recent years, the world is increasingly applied technology supporting the underground rooms anchors with two component fast setting mixture or less, AT anchors. This technology successfully replaces the traditional way of supporting and improving the quality of underground spaces made in terms of increasing their stability. All this results in reducing the need for multisheet reconditioning of parts of the mine, which significantly increases the security of the site.

From all this emerged the proposal to place a circular underground room used arched shape of the cross-section with the same surface area, and that in order to reduce costs and increase the rate of development, consider the application of more sophisticated and cheaper materials for supporting, ie. combined support. Mixed-timbering in this case includes steel support on a larger axial distance in combination with anchors (anchors).

Based on the above proposals, in this paper deals with the influence of the shape of underground facilities and the types of support on the use of machines for underground coal mines.

2. TIME ANALYSIS OF UNDERGROUND ROOM

In order to analyze the utilization of machinery for construction of underground rooms, some are working operations time (arrival to the site, review site and machinery, test drilling site in front of the forehead, cutting, drainage, rest, and departure from the site), which are listed in Table 1.

Table 1 - The duration of work operations

Name of work operations	**(min)**
Arrive at work site	40
Summary of Site and machines	10
Test drilling site in front of the forehead	10
Forehead cutting	45
Supporting with steel circular support	90
Supporting with combined support	70
Break	30
The departure from the worksite	40

Duration work operations, drainage and cutting are per 1 m rooms, taking into account the conditions of working environment, the type of support, distance of supporting frames and a cycle of cutting. Time for support is determined empirically,

according to the type of support and working environment. Cutting time is determined based on catalog data on capacity cuts for a particular work environment.

Based on data on the duration of work operations listed in Table 1 and organization of construction machinery unit, made up the Table 2 stating the total duration of extra work operations (arrival and departure from the site, test drilling site in front of the forehead, rest, review site and machinery), cutting the total time and total time for the drainage and the shift (480 minutes). On the basis of time determined by the number of cycles of cutting and supporting the shift, as well as the rest of the time, which can be regarded as a spare time.

Table 2 - Total duration of extra work and cutting operations and supporting the number of cycles for an entire shift of 480 minutes

Name of work operations	Steel Circular support (min)	Combined support (min)
Auxiliary work operations	130	130
Time to cut forehead Site	113	135
Time for supporting and site	225	210
Rest of the time	12	5
Total time (min)	**480**	**480**
Number of cycles of cutting and supporting	2.5	3

Based on the data given in Table 2 diagrams were drawn work operations, in making the rooms round the roundabout and supported steel support (Figure 1) and for making room vaulted shape and supported combined support (Figure 2).

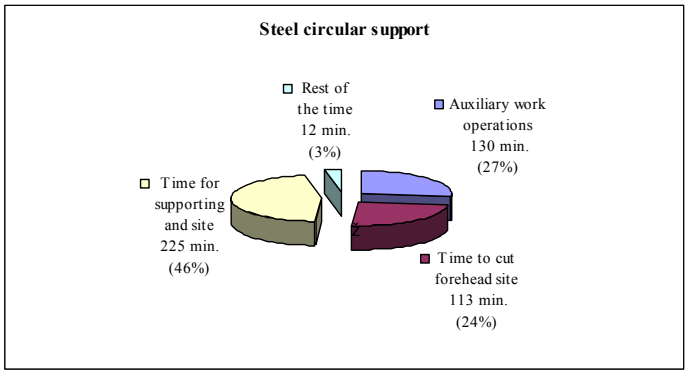

Figure 1 - Diagram of work operations with the development of underground rooms and supported with circular steel support

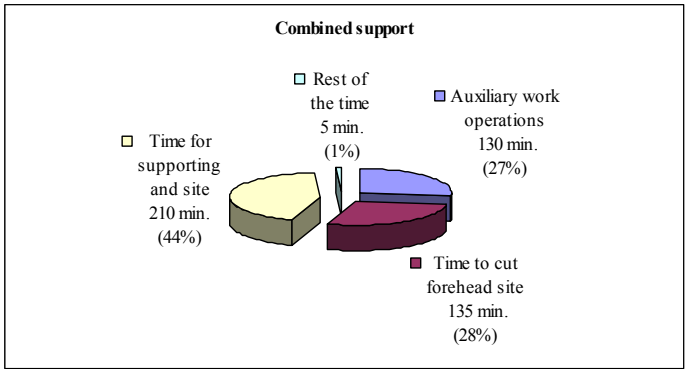

Figure 2 - Diagram of work operations for making the room vaulted shape and supported with combined support

Analysis of data given in Table 2 and diagrams given in Figures 1 and 2 we can state the following:

- changing the shape of cross section and type of support, increasing machine utilization from 24% to 28%, and the time for support is reduced from 48% to 44%, duration of shifts;
- changing the shape of cross section and type of support, while maintaining the same cross-sectional area of underground facilities, and increases the speed of development, which inevitably leads to decrease production costs.

3. CONCULSION

Based on the above work, we can conclude that if we change the shape of the cross section of underground facilities, and apply the combined roof supports in order to obtain greater utilization of machine time, while increasing the rate of development by 20%. Increasing the use of machines and rate of development, reflected to the reduction of costs of underground rooms. On the basis of a given example, the application of other forms of cross-section rooms and other applications support material, compared to those currently applied in the supporting of the mine pits JPPEU, it can be concluded to be very serious with the introduction of mechanized production, review and shape of the cross section of underground facilities, and introducing other support materials.

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