DETERMINING THE RAISONAL LIMITS OF THE TISMANA CAREER AND ITS MAXIMUM ECONOMIC DEPTH

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Abstract: *Determiningtherationallimits of Tismana'scareerandits maximum economic depthis a particularly important problem andneedstoberesolvedbeforetheexploitationbegins. Iftheposition of thedepositcorrespondstothat of the land surfaceandthethickness of thediscoveryissmall, the start of theworksisobvious. If, however, undertheanalogousconditions of settlingthedeposit, thethickness of thediscoveryishigh, it isnotexcluded an advantageousexploitation of thedepositby underground miningworks. Paralleltotheincrease in thethickness of thediscovery of medium andlargeinclines, the volume of therockstobeextractedandremovedincreases, whichleadsto an increase in theup-to-date exploitation.*

Key words: gaussian model, pollutants, mathematical relation, parameters, mathematical modeling

1.Introduction

The Tismana Mining Perimeter is located in the southwestern part of the Rovinari Mining Basin, Gorj County, 30 km from the county seat of Târgu-Jiu, on the right bank of the Jiu River. The activity carried out by EMRovinari in Tismana quarry aims at extracting up to date the lignite from the deposit, used for electricity production. The excavation capacity is 7,888 mc / h, and the capacity of the dump is 15,300 mc / h. To ensure the parameters Operating within the Tismana Quarry, two drilling rods are being run at an average flow rate of 70-90 mc/h, with 9-11 drainage, evacuating 4600 thousand m^3/year, ie 532 m^3/h.

2. The rational limits of day-to-day operations

Determining the rational limits of the career and its maximum economic depth is a particularly important problem and needs to be resolved before the exploitation begins. If the position of the deposit corresponds to that of the land surface and the thickness of the discovery is small, the start of the works is obvious. If, however, under the analogous conditions of settling the deposit, the thickness of the discovery is high, it is not excluded an advantageous exploitation of the deposit by underground mining works. Parallel to the increase of the thickness of the discovery of medium and large inclines, the volume of the rocks that must be increased Extracted and removed, which leads to increased exploitation to date.

When determining career boundaries and choosing how to work in day-to-day operations. Several factors of influence are considered, such as:

- shape and geometrical characteristics of the useful mineral body;
- the settlement of the deposit against the surrounding rocks;
- Physical-mechanical properties of useful minerals and rock;
- tectonics of the deposit and the rock;

- the quality of the useful mineral, the operating losses and the impoverishment during the operation;
- the dynamics of the production and the land to achieve the planned production;
- climatic and operational conditions of operation.

The main indicator determined in assessing the economic effectiveness of mining works to date is the coefficient or ratio found. By coefficient of discovery is meant the value of the volume ratio of sterile rock required to be extracted and removed for each unit of useful mineral substance. Depending on the reserve to which the volume of waste required to be extracted and removed is calculated the geological coefficient of the uncovered and the industrial coefficient To discover. The geological coefficient or ratio to be discovered is the ratio of the total volume of sterile rock required to be removed from the geological reserve volume of the useful mineral material within the perimeter of the perimeter of operation.

The geological coefficient to be discovered, K can be represented by one of the ratios:

$$K = \frac{B}{A} (m^3/m^3) \quad (1)$$

or

$$K = \frac{B}{A \cdot C} \quad (m^3/t) \quad (2)$$

For a horizon of day-to-day exploits, the expressions of the geological coefficient to be discovered appear under the forms:

$$K = \frac{\Delta B}{\Delta A} \quad (m^3/m^3) \quad (3)$$

or

$$K = \frac{\Delta B}{\Delta A \cdot C} \quad (m^3/t) \quad (4)$$

In which: B, ΔB - the volume of sterile rock required to be removed, m^3;
A, ΔA - reserve of useful mineral substances, m^3;
C - the volumetric weight of the useful mineral, t/m^3.

The coefficient or industrial ratio to be discovered is the ratio of the volume of waste rock excavated and removed to each unit of industrial useful mineral material. Generally, the resulting sterile rock in the up-to-date exploits of the removal of the cover formations, the widening of the slopes and the removal of the sterile intercalations included in the thickness of the substance Useful minerals, in the form of intermediate strands, the proposed interaction, lenses.

The industrial coefficient to be discounted is calculated as follows:
- on average, on the deposit (on the pit);
- on the horizon or extraction stage;
- for a certain period of career activity;
- at the operating depth limit to date.

3.Calculation of the medium coefficient to discover

The average uncovered coefficient represents the ratio between the volume of the waste rock and the mineral reserve of the entire operating field or one of its sectors.

$K = \frac{B}{A}$ (m³/m³) (5)

or

$K = \frac{B}{\gamma \cdot A}$ (m³/t) (6)

The industrial reserve of useful substance is less than the total balance sheet due to reserves designed to remain in areas banned from exploitation and reserves lost through exploitation (extracted with discovery, left as slices and inadvertently left in the exploited space). If in the perimeter of operation are not designed reserves, to remain in areas forbidden to exploitation, the industrial reserves will be given by the relation:

$A_{ex} = A - A_p$ (7)

where: $A_p = 0$; $A_{ex} = A$

$A_1 = A(1-\lambda)$ (8)

where: λ-loss ratio.

Knowing that 15 million m³ of tailings and 1 mil m³ of useful mineral substances are contained in the volume of the capital works executed for the opening of the quarry, it is possible to determine the value of the average coefficient of discover for the whole quarry and the value of the coefficient of the discover environment for the quarrying period, knowing:

- the volume of tailings contained in the contour of the quarry;
- the useful volume contained in the career contour.

The average coefficient of discovery for the whole quarry is determined with the relation: $K_{med} = \frac{B}{A}$ (m³/m³) (9)

$K_{med} = \frac{300 \cdot 10^6}{80 \cdot 10^6} = 3,75$ (m³/m³) (10)

The average coefficient to be discovered for the period of exploitation of the quarry is calculated with the relationship:

$K_{med} = \frac{B - B_c}{A - A_c}$ (m³/m³) (11)

Where: B_C and A_C - sterile volumes and useful extracts for the execution of the capital opening works of the quarry.

4. Calculation of the limited co-efficient from the economic position

The economic limit coefficient is the maximum allowable coefficient k_2 in an operating method. In quarrying, there is a steady increase in total unit cost, as the pit grows, due to the increasing volume of tailings, which must be removed to extract a tonne of useful substance.The calculation ratio of the maximum permissible lag is:

$K_L = \frac{C_{ad} - a}{b}$ (m³/m³) (12)

where: C_{ad} – The cost of extracting a tonne or m³ of mineral useful underground, lei/t or lei/m³;

a - the cost of extracting a tonne or m3 of useful mineral material through day-to-day exploitation, without taking into account the costs for the extraction of waste rock, lei/t or lei/m³;

b - expenditures for the extraction of one m³ of sterile rock, during the day-to-day exploitation, lei/m³.

For a horizontal lignite layer located on the slope of a hill, with the working front length L = 1200 m, the layer thickness m = 8 m, the slope angle of the working front α = 40°

and the thickness of the opening H = 80 m, It is possible to determine the average uncovered ratio and the ratio of the last extraction horizon if known:

- the maximum admissible planned cost of the lignite tonne extracted by works, Cad = 90 lei/t;
- the cost of extracting a tonne of lignite without taking into account the discounted expenses, a = 18 lei/t;
- the cost of extracting a m^3 of discover, b = 15 lei/m^3;
- coefficient of extraction, n = 0,95.

To determine the average discovered ratio, use the relationship:

$$K_{med} = \frac{H\cdot(0{,}5\cdot L\cdot tg_{\alpha}+m)+0{,}33\cdot H^2}{\text{[illegible]}} \quad (m^3/t) \qquad (13)$$

where: $\gamma_v = 1{,}22\ t/m^3$

$$K_{med} = \frac{\text{[illegible]}}{\text{[illegible]}} = 4{,}52\ m^3/t$$

The average industrial ratio will be:

$$K_{imed} = \frac{K_{med}}{\text{[illegible]}} (m^3/t) \quad (14)$$

$$K_{imed} = \frac{\text{[illegible]}}{\text{[illegible]}} = 4{,}65\ m^3/t$$

The discovered report of the last drawing horizon is calculated using:

$$K_o = \frac{H_{med}}{\text{[illegible]}}\cdot\left(1+\frac{H_{med}+m}{\text{[illegible]}}\right) \quad (m^3/t) \qquad (15)$$

$$K_o = \frac{\text{[illegible]}}{\text{[illegible]}}\cdot\left(1+\frac{\text{[illegible]}}{\text{[illegible]}}\right) = 9{,}056\ m^3/t$$

The limit of uncovered ratio is determined with the relationship:

$$K_L = \frac{Cad-a}{\text{[illegible]}} (m^3/m^3) \qquad (16)$$

$$K_L = \frac{\text{[illegible]}}{\text{[illegible]}} = 4{,}8\ m^3/m^3$$

Conclusions

By comparing the average industrial ratio, $\mathbf{K_{imed}}$ with the limit of discover ratio, $\mathbf{K_L}$ it is noticed that the latter is higher ($K_{imed}<K_L$), which shows that up-to-date exploitation can continue for the following extraction horizons, with a more high erth anaverage discovery ratio, including up to the horizon whose discovery ratio is $\mathbf{K_O}$= 9,056 m^3/t.

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