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MINING AND GEOMETRIC ANALYSIS OF THE QUARRY FIELD WITH A SOLID DESIGN OF THE WORKING BOARD

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Abstract: The paper considers the issues of development of the operating mode of mining operations at the deposit on the slope. The development of the deposit is determined in the form of a working side of a quarry. The ways of modeling the transverse profile of the field are investigated

Keywords: quarry, overburden ratio, slope angle, ore body dip angle, overburden, linear elements.

As is known, when substantiating the regime of mining operations in quarries, it is required to determine the final depth of the quarry ( ), as well as to identify the magnitude and calendar distribution of overburden and ore volumes. Both problems were solved on a graph-analytical model [1].

In the first task, the parameters varied in the previously mentioned ranges [1] were the angle of the slope (φ), the angle of the deposit (αz) and the thickness (M) of the deposit. There were functions). Analyzing the obtained dependencies (Fig. 2 - 4), we can note the following.

Picture. 1. Zones of occurrence of the ore body relative to the slope (φ =35°)

Sector 1 - zone of consonant occurrence

Sector 2-3-4-5-2-3 - unconformity zone:

peak volume area V_H ;

area of minimum value V_H

Picture. 2. Dependence of the final depth of the quarry on the angle of inclination of the slope at different values of the angle of occurrence of the ore body.

Picture. **3**. Dependence of the final depth on the angle of occurrence of the ore body at different values of the angle of inclination of the slope.

Rice. Fig. 4. Dependence of the final depth on the thickness of the deposit at different values of the dip angle of the ore body (= 10°).

Picture. **4**. Dependence of the final depth on the thickness of the deposit at different values of the dip angle of the ore body (= 10°).

As we move from consonant to unconformity occurrence of the ore body (with increasing), the slope angle has less and less effect on the final depth of the quarry, and when equality is reached where is the slope angle of the side in the limit position, this influence in the model completely stops (Fig. 2 and 3). The foregoing is true at a constant value of the boundary stripping ratio.

The dependence is linear (Fig. 4), and the proportionality coefficient increases with increasing angle in the range of 30-40°. In this range, the transition of the ore body into the zone of unconformity ( ) has little effect on the value of .

It was noted above that the characteristic difference of the studied type of deposits from all others is a large amount of capital mining ("overhanging") overburden. The dependence of the quantity on the angle of inclination of the slope was shown in fig. 5. The presence of two areas of peak volumes can also be seen on the graph, here the second area is also unfavorable in terms of mining operations (6).

It is of interest to analyze the dependence of the volumes of "overhanging" overburden on the slope angle of the working side at different values, because it is clear that with an increase in the steepness of the working side, they should decrease. For this purpose, on the mentioned model, the angle value varied from 0 (layer development) to 40°. Two regions of peak volumes were studied: at - = 60° and 165°.

Picture. **5**. Dependence of "overhanging" volumes of mining-capital overburden on the value of .

at different slope angles (= 18 m, = 15°).

where: -consistency angles. It has been established that in the first region, peak volumes fall compactly in the range of angles = 40-43° (Fig. 7), and an increase in the steepness of the side (from 0 to 20-25°) does not lead to a significant decrease in volumes. In the second region, all functions are more sensitive to changes in the angle , and the peak volumes shift over a wide range of angles (Fig. 8).

Picture. **6**. Dependence of "overhanging" volumes of overburden on the angle of incidence of the ore body with a discrete change in the thickness of the deposit.

Picture. **7**. Dependence of the volume of "overhanging" overburden on the angles of inclination of the slope and the slope of the working side (the angle of occurrence of the ore body = 60°).

The dynamics of the change in "overhanging" volumes can be characterized through the increase (gradient) of these volumes with decreasing angle (Fig. 9). It can be seen from the graph that with an increase in the steepness of the working side, the difference in volumes before and after an increase in the angle also increases. This trend is especially characteristic for the range of angles = 20-30°. The noted fact once again testifies in favor of a possible greater increase in the slope angle of the working side.

Picture. 8. Dependence at….

Picture. **9**. Dependence of the gradient on the angle of the working side ( ).

The final conclusion about the possibility and effectiveness of this measure within the framework of the traditional technology of mining a deposit can be decided as a result of a mining and geometric analysis of a quarry field, i.e. by solving the second of the above two problems. Algorithms for calculating layered and increasing volumes of overburden and ore, algorithms for plotting mining schedules were developed; appropriate programs have been drawn up.

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