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# Research Design of the Main Parameters of the Quarry

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**Abstract**

The article deals with the study of the design of the main parameters of a quarry. The correct choice of the depth and contours of the quarry is described, since they determine the volumes of minerals involved in the development.

**Keywords:** design productivity of a quarry, working site, quarry capacity, stripping ratio, quarry edge, quarry parameters.

The open pit mining of solid minerals has become widespread, both in our country and in the world, and is, in fact, the general direction and main tool in the mining industry, at least for the coming decades. This is due to its significant advantages compared to other mining methods and, first of all, open pit mining: in terms of the production capacity of mining and ore-dressing enterprises; safety, productivity and working conditions; capital and operating costs; mechanization, automation, robotization, informatization and computerization of production; completeness of subsoil use [1].

The correct choice of the depth and contours of the quarry is extremely important, since they determine the volume of minerals involved in the development, and the volume of overburden to be removed [2]. The adoption of the narrowed boundaries of the open pit when designing may require the further transfer of trenches, dumps, structures, and unreasonable expansion of the boundaries may necessitate the implementation of additional volumes of overburden work, an increase in the range of transportation of the rock mass.

In the methodology of total complexity, we single out the initial systemic complex of parameters of quarries and coal mines, which is schematically presented in fig. one.

Categories of open pit and section parameters

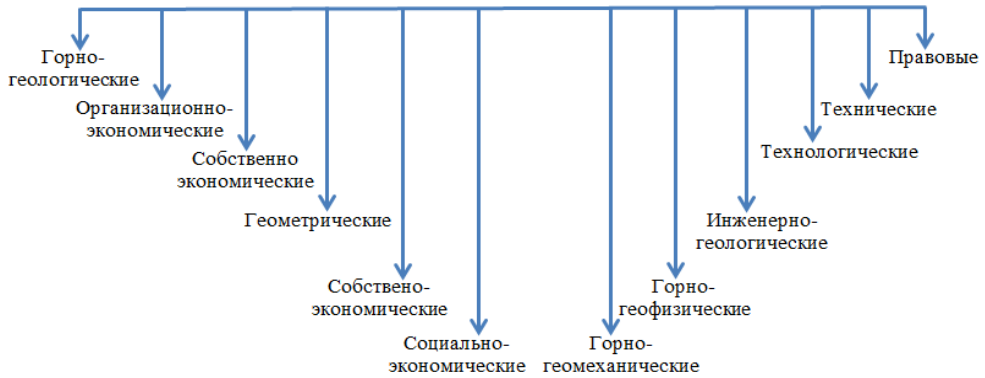


Fig.1. System complex of categories of parameters of quarries, coal and shale mines (in their wide manifestation)

Below are the compositions and methods for determining the parameters of the most characteristic main categories, which primarily include the productivity of a quarry.

Design definition of the productive capacity of a quarry. The production capacity of a quarry (Рк) is determined in the project both by the extraction of minerals Q_d, and by overburden Vв, and, consequently, by the rock mass Q_ (g.m.), while

Q_(g.m.)=V_v+Q_d, (1)

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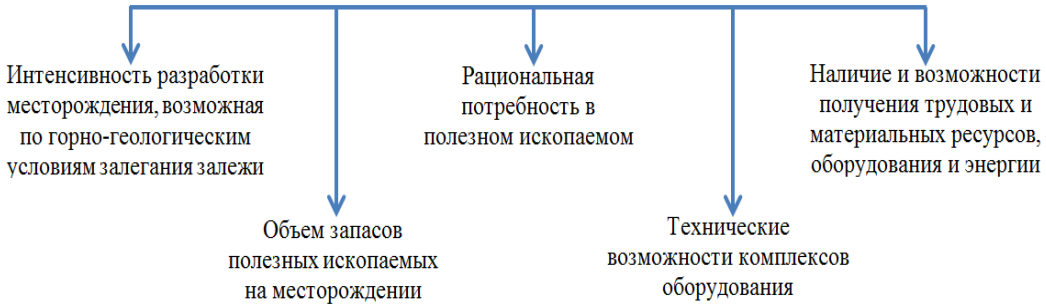
When developing horizontal (or almost horizontal) deposits, when the technical stripping ratio (Kw.t.) is equal to the average stripping ratio (Kv.s.)

P_v \u003d P_d-K_ (v.s.) (2)

During the development of inclined and steeply dipping deposits, the capacity of a quarry in terms of rock mass varies over a wide range during its life. In this regard, it is established for the main periods of development [3].

In projects, when determining the productivity of a quarry, the main factors are taken into account:




*Rice. 2. Types of main factors taken into account when establishing the design career performance.*

The production capacity of the quarry for the extraction of minerals$_{is}$ approximately determined by:

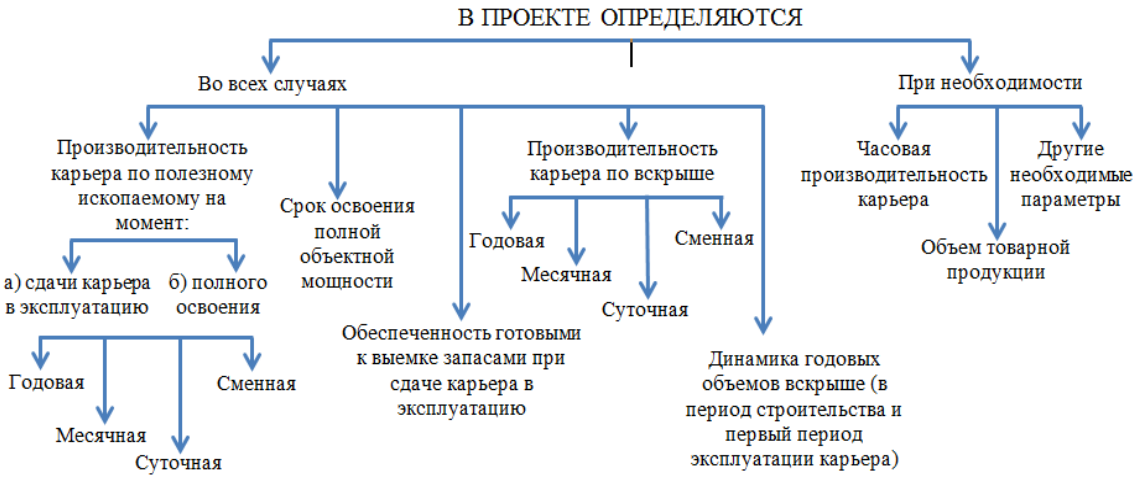
(a) *Under* ***the conditions*** of deepening (sinking to depth) of mining operations according to the formula

$$\Pi_д = V_j \cdot S_j \cdot \frac{1-\Pi_1}{1-P_3} \quad (3)$$

where is the rate of decline of mining operations in the $V_j$j-th stage, m/year; -the area occupied by the mineral within the boundaries of the working area at the $S_j$*j-th* stage, m$^2$; and -respectively the coefficients of loss and dilution, the shares are the same.$\Pi_1 P_3$

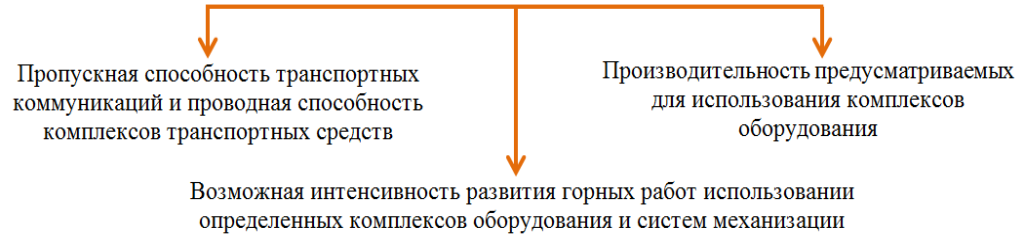
In the 50-60s of the XX century , *j*≈6÷8 and 10-15 m per year, respectively, for railway and road transport; in the 70-80s, it was respectively 7-10 and up to 20-25 and from 12-18 to 50-55 m per year.

In some cases, the rate of reduction of mining operations reached 55-60 m in year.




*Rice. 3. Conditions under which the design performance of the quarry is determined.*

The main components of the main determining factors of the applied equipment and technology




*Rice. 4. The main components of the technique and technology of development.*

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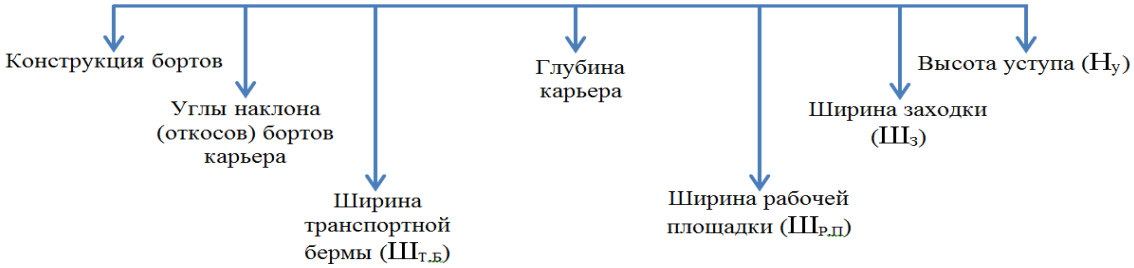
b) When ***developing horizontal and gentle mineral deposits,*** the ratio of overburden and mining speeds is taken into account. In these cases, the annual productivity of the quarry is determined on the basis of the formula:

$$П_д = V_д \cdot М_{п.и} \cdot \alpha_{ф.д} \cdot \gamma_{п.и} \frac{1-П_1}{1-Р_з}, (4)$$

where $V_д$*is* the annual rate of advancement of the mining front; - the capacity of the deposit (reservoir) of the mineral; - length of the mining front; - The density of the mineral.$М_{п.и}\alpha_{ф.д}\gamma_{п.и}$

The most important characteristics of the parameters and boundaries of the quarry




*Rice. 5. The main characteristics of the parameters of the quarry.*

The width of the work platform is taken to be equal to 40÷60 m for vehicles and 75-80 m for railway transport; with rock rocks and the use of mehlopate $Н_ш$ = 14.5÷27 m; with railway transport (and rock g.p.), single-track track $Ш_{Т.В}$ = 7.5 + H, m (H - width of the reserve safety berm), double-track-Sh $_{Т.В}$ = 13.6 + V. When determining the parameters and boundaries of quarries, an important role is given to establishing the values of overburden and rock mass coefficients, the system list of which is presented in Fig. 6. To establish their values, the basic dependencies (5) - (18) [4] are used.

The overburden coefficients of the above types are determined on the basis of dependencies:

| | | |
|---|---|---|
| Overburden coefficient - | $К_в = \frac{V}{Q}$ | (5) |
| Overburden coefficient volumetric - | $К_{в.о} = \frac{V_o}{Q_o}, \frac{м^3}{м^3}$ | (6) |
| Overburden coefficient mass - | $К_{в.м} = \frac{V_м}{Q_м}, \frac{т}{т}$ | (7) |
| Average industrial overburden coefficient - | $К_{в.с.п} = \frac{V_п}{Q_п}, \frac{м^3}{м^3}$ | (8) |
| Average overburden performance factor | $К_{в.с.з} = \frac{V - V_с}{Q - Q_с}, \frac{м^3}{м^3}$ | (9) |
| Contour overburden coefficient - | $К_{в.к} = \frac{V_к}{Q_к}$ | (10) |
| Current overburden coefficient - | $К_{в.т} = \frac{V_т}{Q_т}$ | (11) |
| Horizontal overburden coefficients - | $К_{в.п.г.} = \frac{V_г}{Q_г}$ | (12) |
| where *V*, *V0*, *VM*, *VK*, *VT*, *VG* is the amount of waste rock (overburden) respectively dimensionless, bulky (m), massive (t), removed by expanding the contours of the quarry over a certain period of time. | | |

The final contours of the quarry are divided into finite, perspective and intermediate.

Approximately *the perspective depth of the* quarry (), and consequently, its contours are determined on the basis of dependence$Н_{к.п}$

$$Н_{к.п} = Н_{к.к}\left(1 + \frac{\Delta Н}{100}\right), \quad (13)$$

where is the final depth of the quarry, m$Н_{к.к}$

$$\Delta H = f(p), \quad (14)$$

where is the confidence probability, which is recommended to be used in the development of valuable ores

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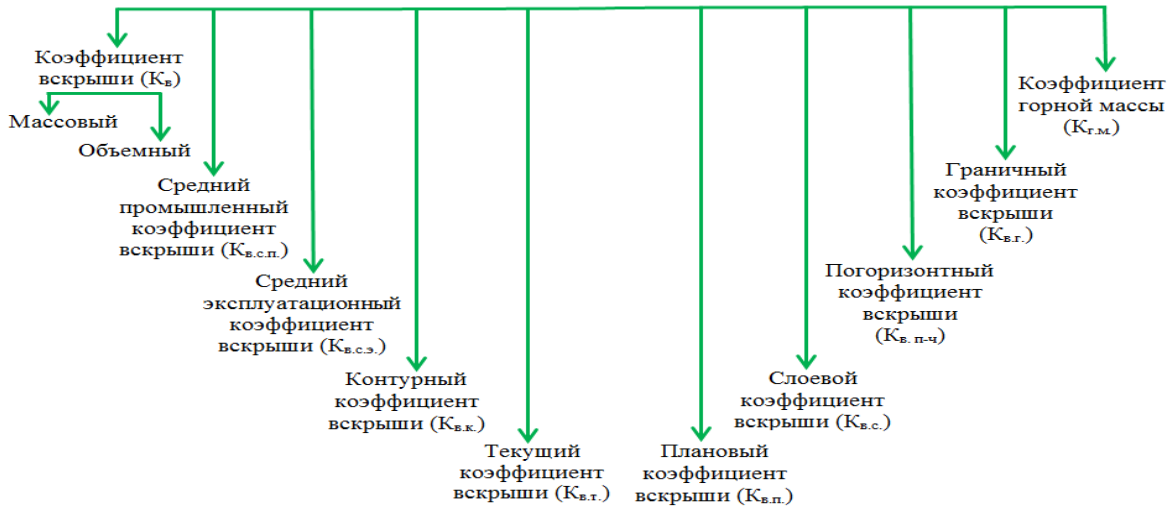
pof 0.9÷0.95, and under normal conditions - equal to 0.8÷0.85.

Overburden and rock mass coefficients




*Rice. 6. System of overburden and rock mass coefficients.*

*The intermediate contours of the quarry* are usually established at intervals of 10-12 years within the perspective contour of the quarry.

Herewith

$K_{г.м} = \frac{V_{г.м}}{Q_м} = \frac{V_в + V_{п.и}}{Q_м}$, (15)

where is the volume of the rock mass, m; -overburden volume, m; - the volume of minerals,$V_{г.м} V_в V_{п.и}$ m3; $Q_м$- amount of metal, t.

$Q_м = V_{п.и} \cdot \gamma \cdot c$ , t, (16)

where is the average density of the mineral; c-the average content of a metal (or utility component) in a mineral, fractions of a unit.$\gamma$

Therefore

$К_{г.м} = (1 + К_в)/\gamma \cdot c$. (17)

*The boundary* overburden coefficient is determined based on the dependence

$К_{в.г} = \frac{(С_г - С_д + К_п Ц_п)}{С_в}$,(18)

where is the permissible cost of $1С_г$ m3 of minerals, rubles; $С_д$-cost of 1 m of mineral, rubles; $С_в$-cost of 1 m of overburden, rubles; -selling price (or selling price) of incidentally mined minerals, rubles / t; $Ц_п К_п$- the coefficient of associated production, equal to the ratio of the volume of incidentally mined to the volume of the main mineral, the share of units.

Determination of the depth of the quarry by the boundary overburden coefficient is carried out on the basis of dependence 19.

$H_к = \frac{(K_г/\lambda)M}{свg\gamma_п + свg\gamma_в}$, (19)

where $K_г is$ the boundary overburden coefficient, $m^3/m^3$; -horizontal deposit thickness, m; $M\lambda$=1.15÷1.8-coefficient of uneven stripping; and -angles respectively repayment and temporary sides of the quarry$\gamma_п \gamma_в$ [5].

Traditional and modern design methods (based on materials by V.S. Khokhryakov, V.A. Shestakov, etc.)

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*Fig. 7. Methods of designing geometric parameters of quarries*

The applied and applied methods of designing the geometric parameters of quarries, summarized by some prominent scientists, are schematically presented in Fig. 7.

The maximum permissible value is considered to be the final depth of the quarry $H_k$ at which the contour overburden coefficient is equal to the boundary.

The contour overburden coefficient for the simplest occurrence conditions ($K_k$) is:

$$K_к = (\Delta V_{вл} + \Delta V_{вв})/\Delta V_и \quad (20)$$

where $\Delta V_{вл}$, ,$\Delta V_{вв}\Delta V_и$ - respectively the increment of overburden volumes from the side of the recumbent and hanging sides of the deposit and the mineral with an increase in the depth of the quarry by the amount of h.

The design of the boundaries of the open development of the field involves the establishment of the depth and contours of the quarry, the position of the upper and lower edges and the side surface.

The study confirms that it is rarely possible to accurately determine the depth and position of the contours of the quarry for the long term when designing.

But when designing a quarry, changing the traffic patterns of heavy dump trucks and due to the correct choice of an excavator, you can increase the slope angle of the quarry side, reduce the upper parameters of the quarry and with this reduce the cost of developing this field.

**References:**

1. G.V. Sekisov, V.S. Alekseev "Quarry Design" textbook Khabarovsk PUBLISHING HOUSE OF PNU 2017
2. V.S. Khokhryakov "Quarry Design" textbook Moscow Subsoil 1992
3. V.I. Galkin, E.E. Sheshko "Transport Machines" textbook Moscow 2010
4. V.V. Rzhevsky. Open pit mining. Production processes. M.: Knizhnyi dom «Librokom», 2010 g.
5. V.V. Rzhevsky. Open pit mining. Technology and integrated mechanization. M.: Knizhnyi dom «Librokom», 2010 g.
6. Nosirov U.F., Makhmudov D.R., Zairov Sh.Sh., Abdurashidov Sh.M. Study of the cracking zone during the crushing of rocks by explosion. Mining Herald of Uzbekistan 2017 No. 4 Art. 19-21.
7. Yermekbayev U.B., Giyazov O.M., Abdurashidov Sh.M. Study of the method of draining the quarry and the drainage scheme with a phased increase in the depth of the Muruntau quarry. TESNIKA E-ISSN 2181-0753 N: 3 2020 art. 39-40.
8. Khakimov Sh.I., Abdurashidov Sh.M. Evaluation of the efficiency of rock mass movement, taking into account the influence of the size of road transport on the volume of mining and capital works. Oriental Renaissance: Innovative,educational, natural and social sciences 2021 articles 504-512.