



Analysis of the Impact of Dilution, Loss and Other Factors on the Efficiency of a Mining Enterprise

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Abstract: The article provides analytical information about the negative impact of dilution, loss and other factors, which are the main factors affecting the efficiency of a mining enterprise, and highlights the influence of these factors on the cost of the final product. The border data on the dilution and loss of ore are presented. The influence of dilution and loss on the quantitative change in the deposit has been studied.

Keywords: dilution, loss, ore, mining, factor, price, profit, coefficient, industry, minerals, funds, indicator, final product.

Introduction

One of the pressing problems facing the world community is the current complex international economic problems, radical reform of all existing spheres during the energy crisis, reaching a new level. In these sectors, the mining industry is of great importance, providing raw materials for many branches of the fuel and energy complex, manufacturing, heavy and light industry. This year, the share of the industrial sector in the gross domestic product of the country is 29.2%, of which the indicator of the mining and metallurgical industries is 47.9% [1]. This means that the role of the mining and metallurgical sector is higher among all industries.

Raising the potential of the mining and metallurgical industry is carried out at the expense of increasing the technical and economic indicators of mining enterprises. The effectiveness of the extraction of mineral deposits depends on several factors, the analysis and management of which has a positive effect on the activities of the mining enterprise [2-4]. These factors are as follows: price, cost, dilution, loss, coefficient of extraction of a useful component, average amount of a useful component and labor consumption.

Price is one of the main factors that most economically affect the activities of the enterprise, characterized by frequent changes in the world market. Monitoring the change in the value of Mineral raw materials and final product, the implementation of important measures will provide an opportunity to prevent possible negative consequences in the future. Below is a graph of the dynamics of the change in the price of gold in the world market for 10 years [5] (fig.1).

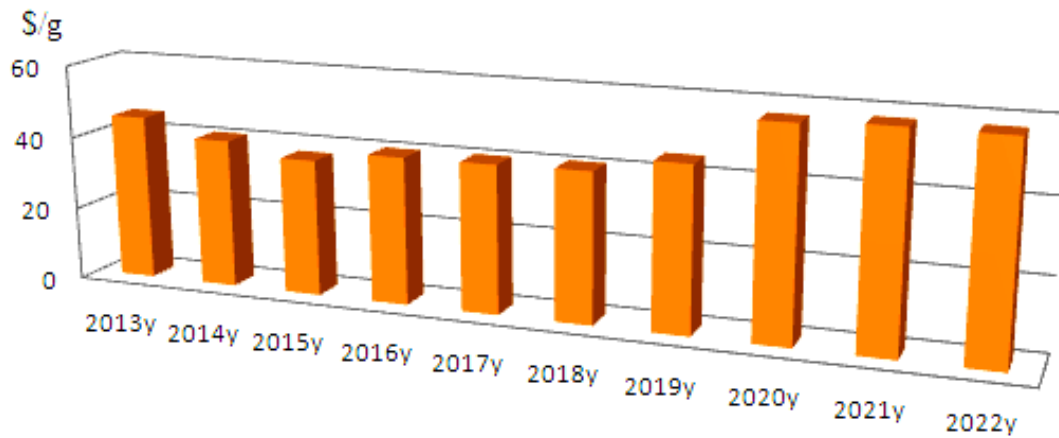


Figure 1. Chart of gold price changes during 2013-2022.

Price is the main factor that determines the final cost of a product, having a direct impact on the indicator of efficiency. The price of tools and services used by a mining enterprise, as well as the continuous change in the mining and geological conditions of exploration, mining work, cause a large increase in total spending. The ratio between the costs of production and the cost of mineral raw materials or final product is an indicator that reflects the activities of the enterprise. In countries with developed mining industries, this indicator is 0.2-0.6.

Research method

Dilution is considered one of the main sizes that characterize the indicators of mineral extraction. The dilution, along with the ore, causes an increase in excessive unproductive costs for the extraction, transportation and processing of the waste rocks to the enrichment factory, as well as mining work to achieve the amount of metal in the plan, causing significant economic damage. The profit received by the mining enterprise will disproportionately decrease to it as the quality of ore increases (fig.2). Reducing the dilution by 1% will lead to a decrease in the cost of ore by 3.8%. According to the calculation work, the damage seen from 1% dilution is greater than the damage seen from 1% loss, varying differently according to mining systems [6].

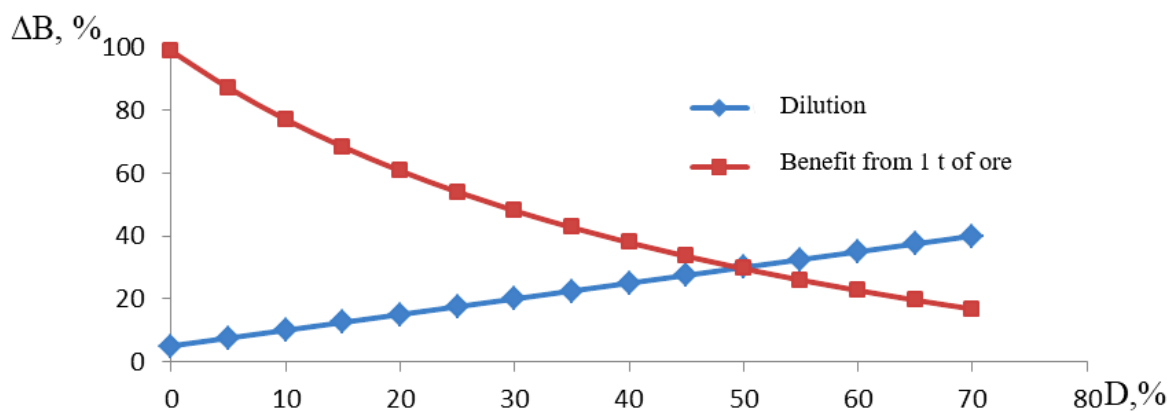


Figure 2. The graph of the decrease in the profit of the enterprise as a result of dilution.

The loss directly affects the activities of the mining enterprise, expressing the degree of rational use of the earth crust. Funds allocated for the search for a mine, mining, construction of a mining enterprise, the creation of infrastructure, capital investments are spent a certain amount inefficiently as a result of the loss. Alternatively, the destruction causes a decrease in mine's productivity, a decrease in balance reserves, as well as the operational endurance in the plan. With increasing loss, the profit that a mining enterprise receives decreases inversely proportional to it ($B \sim 1/P$). All of the above negatively affects mine's ability to compete in the world market, leading to an increase in the cost of final product.

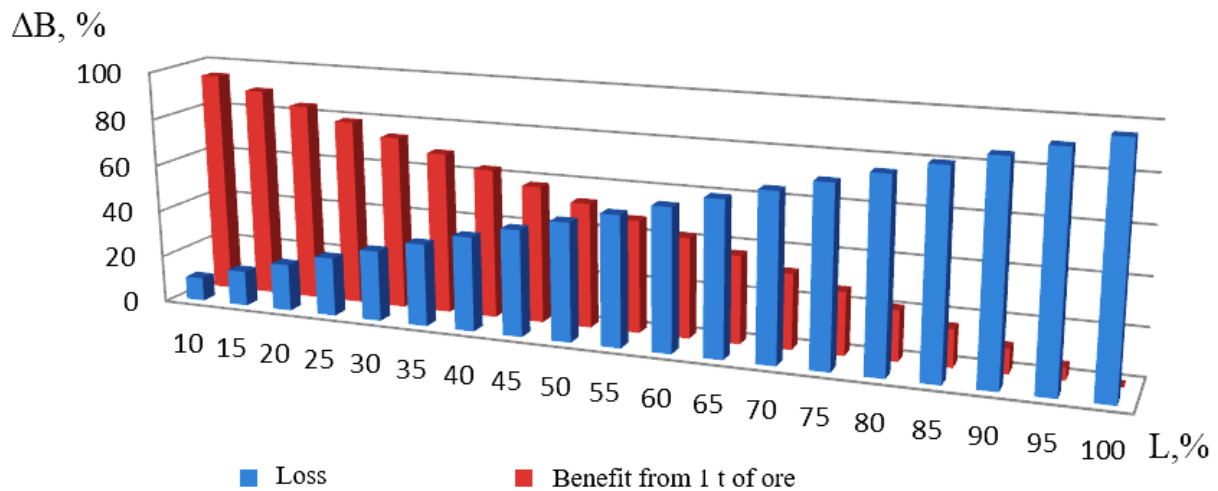


Figure 3. The graph of the decrease in the profit of the enterprise as a result of disposal.

The degree of extraction of the useful component is as important as the factors presented above, directly affecting the effectiveness of the activities of the entire mining and metallurgical complex. Although all production processes of mining of mineral deposits have high performance, a low level of extraction of a useful component in the enrichment process causes the cost of finished products to remain high. The degree of extraction of the useful component varies from 60% to 95%, depending on a number of indicators, including the chemical, mineralogical and granulometric composition, density, strength of the ore and the presence of harmful additives[7].

Results

The presence of the composition of the useful component in moderate quantities is one of the main indicators that determine the quality of the ore mass. The amount of this indicator depends primarily on the determination of the boundary of the contour of the balance reserves, which is determined during the period of geological and economic assessment of the mine. Ensuring the constancy of the amount of a useful component is among the main tasks facing the mining industry. A change in the permanence of the ore component causes a decrease in the indicators of metal extraction in the process of enrichment and metallurgy[8,9]. The effect of the deterioration of the consistency of the ore component by 1% on the metallurgical process is assessed as equal to the economic damage caused by a decrease in the ore content by 2.5% of the metal. The stability of the useful component composition has a positive effect on the efficiency of technological processes, ensuring the operation of the processing network in an unchanged order.

Labor consumption is one of the indicators that assess the efficiency of mining and is expressed in the unit of labor and period spent on the extraction of 1000 t of ore mass. Achieving relatively high mining performance through low labor consumption causes the savings allocated by the mining enterprise for wages, energy, material consumption and depreciation. When determining labor costs for the extraction system, it is also necessary to take into account the degree of loss and dilution. While the reduction in loss in turn affects the reduction in labor consumption as well, the dilution of the ore leads to excessive time and labor costs for the extraction, transportation, processing of the ore. And all this causes an increase in unproductive costs for the enterprise[10-12].

Conclusion

The factors listed above directly affect the work of the mining enterprise for the extraction and enrichment of minerals and represent the overall effectiveness. According to the results of the analysis, indicators of loss and dilution not only have a significant impact on the effectiveness of mine, but also determine the range of changes of other factors. Reducing the dilution of ore by 10-40% makes it possible to reduce the cost of the final product by almost 2 times. No feasibility

measures can ensure the efficiency achieved in reducing the quality and loss of ore, whether in the mining process or in the enrichment process.

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