

# Stages of planning of operational mining processes in the design of an open pit mine

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**Abstract:** Short-term plans for open pit mining were given along with short-term plans for the border area of the mine. This model simulates a complex system of trucks and shovels and takes into account the uncertainties associated with the operation of trucks and shovels. This ensures that operational plans are aligned with net present value and ensures that the planning phase is more thorough. Two main subproblems are addressed in this study. First of all, there is the problem of choosing equipment that determines the number of trucks and shovels. In the second subproblem, key performance indicators are evaluated using resources defined in the front loader and shovel system. In both stages, the optimal short-run production schedule is a key factor in the model. The proposed simulation model is developed using simulation software and is applied to a real open pit iron ore mine. As an example, several research processes on the planning of the location of mining enterprises are given. Operation of open-pit mining enterprises is usually carried out through the work plan (technical documents) of the mining stages. In opencast metal ore mining, each push operates one or more drilling rigs in the mining process, and the main operational tasks include: Drilling and blasting, loading and hauling are the main processes in opencast mines. In large open pits, shovels and front loaders can be used to perform loading operations. During the planning process, the type and number of loaders are selected and their performance is determined. Connie's gravity and mining speed indicate productivity. This determines its shape and size, which is a relevant step in the design of open pits, and the description of the location and sequence of loading equipment depends on the final process of each pusher. The arrangement of loading equipment in the mine is usually called the formation scheme of the exploitation period. This term is widely used in the mining industry. The purpose of this paper is to introduce strategic mine planning activities in the context of the mining scheme concept in open pit mining. The first part introduces the concept and shows examples where the drawing size is set and the number of spades is changed. Technical processes that may be considered by an open pit planner are outlined.

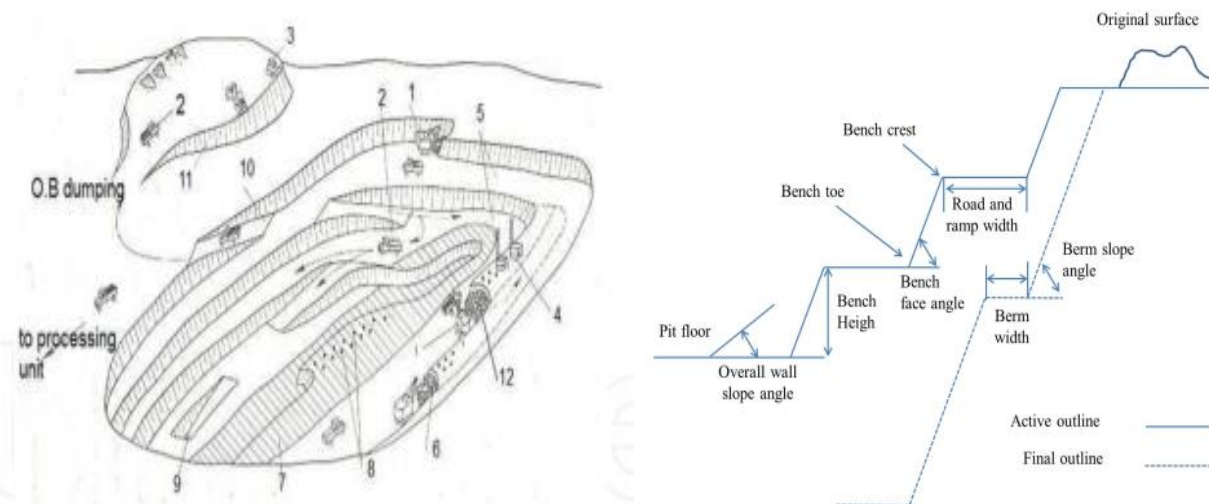
**Keywords:** Open pit mining, mine slope angle, mine planning, ore body, mine design, mining system, open pit mining scheme, open pit parameters.

## Introduction

In the Republic of Uzbekistan, the safety of operations in the mining industry is important. Currently, the mining industry is developing. also, increasing the safety of operations during the lifting process is being implemented at the same time. Although it can be difficult, the main reason for mining innovation to look beyond the small-scale incremental view will be to improve existing systems. Incremental innovation is only possible through new methods and mine redesign is done at different stages of the operation. Currently, one of the highest costs in open pit mining is the loading and transportation phase. During the loading and transport phase, the material is loaded into excavators/shovels, which place the material in the best position available. The truck then loads this material to a processing plant, landfill, or warehouse. Although the current system has many advantages, particularly flexible conveyor-based continuous mining systems, they are expensive and will become more expensive as the operation matures. Therefore, finding ways to improve it is critical to the future of open pit mining. This study highlighted the potential productivity and safety benefits of selecting and potentially improving rock loading transport parameters in mining operations. Incorporating a stress loader into a load and processing system during the loading process can lead to system analysis, component specification discussions, and mine planning and design issues. The authors are aware of some internal studies conducted by various mining enterprises of the Republic of Uzbekistan, mining enterprises have started using electric loaders, and there is very little prospecting in open pits. As such, this article will discuss in detail the potential productivity and performance and safety benefits of introducing an open pit skid steer loader that a haulage system can provide. The opencast mining supply chain in mining enterprises includes preliminary geological exploration and prospecting, resource modeling and mine planning, mine production, including loading and transportation after drilling and blasting, sh and separately It begins with grinding of precious minerals, further processing processes are carried out; done.

Sequential Open mining, loading and transportation phase is usually very important and the mining scheme is mainly based on the performance indicator. Overburden mining is characterized as a highly capital intensive mining method. Open pit mining differs from underground methods in productivity and cost. Each of them contains wastes and ores mined through layers from the mine. Examples of work performed in preparation for open pit mining include: drilling and blasting, loading and hauling. Capital investment in a mine is mainly related to acquisition, and equipment is required for each operation. In large metal mines, loading can be done with different directions of operation with front loaders installed. Mineral resource planning is a complex activity. The main difference between the mining industry and other sectors of the industry is the corresponding ore body, which we divide into primary assets, finite and non-renewable resource groups. In addition, a mine plan must be developed with uncertain information such as the characteristics of the ore body and the economic factors reflected in the mine design. The strategic planning stage of mines is the main decision-making activity and the main objective of regulating the exploitation of mineral deposits. These decisions are responsible for choosing: mining method, processing route, mining sequence, size of operation, and intersection variables that allocate a valuable portion of the ore to the mine will consist of cutting category. On the other hand, tactical mine planning deals with routine planning and mine operations are carried out during the mining phase. These activities include: strengthening operations and others, such as medium and short-term production plans, budget preparation, equipment and production deployment, monthly, weekly or daily planning to ensure the continuous execution of mine processes. In strategic mine planning, processes in the mining industry focused on the main decisions of the mine project and compliance with geotechnical requirements in mine planning. In the research conducted in this field, the geological location of the mine, the complexity of the problem arising from the existing interdependence, show the difference between its variables. For example, it is impossible to determine the limit of mining in a mine, and it is impossible to determine the method without predetermining the sequence of mining, it is impossible to determine the path of intersections, the volume of use and the path of processing. Likewise, there cannot be other variables that cannot be based on the results of the analysis identified without identifying the remaining variables. Therefore, the solution requires planning the geotechnical documentation of the mine using recursive and iterative methods. The slope angle of the open pit is required in the initial feasibility study. The degree of confidence in calculating the slope angle depends on the actual situation. The geotechnical conditions of the slope angle of the pit formed during mining can be estimated as follows Mining of shallow high-grade ores depending on conditions during mining processes in favorable geological and climatic conditions. Slope angles are economically insignificant, and flat slopes can be. It is not necessary to take into account the stability of the slope and the parameters of the mine, the part of the border area can be used. Excavation of ore bodies of variable grade in favorable geological and climatic conditions, implementation of mining process in the mine based on the conditions. Slope angles are important, but not critical, in determining the economics of mining operations. Approximate analysis of slope stability usually has sufficient data. Mining of low-grade ore in unfavorable geological and climatic conditions. Slope angles are very important from a mining and economic point of view to ensure safe operation.

In open pit mining, the slope angle of the mine should be as vertical as possible. The worker bends, then flattens until they reach the outside, the surface is cut. In both methods, the horizontal flow of stress through the vertical section and without the participation of the end pit is shown in Fig. 1. Pre-existing horizontal stresses with excavation located at the bottom of the pit. Due to the vertical stresses, the compressive force is also reduced and the path is cleared to remove the excess load. The ore body located between pit contours mainly causes cracks and joint opening processes as a result of stress removal. External forces reduce the rock's ability to hold. Groundwater can flow more easily, which can reduce the effective normal strength of the crack. As the depth of the pit increases, the extent of the stress zone increases and the failure becomes more severe. This has a negative impact on the economic performance of the mine. This causes problems in several processes during mining.



Picture 1. This type of scheme is used in the implementation of open pit mining processes.

In this regard, the main level of mining is to influence the variable in the mine planning process, to maximize the performance of the equipment. Determining the rate of extraction is part of the measurement of the exploitation stage, the purpose of which is to maximize the economic value of the mine. The opposite view from the process and the rate of extraction are determined in the first exploitation scheme. There may be processes that cannot keep up with this mining rate and equipment will need to be maxed out. Therefore, when designing schemes, it should be done purposefully, and when designing a mine, it is necessary to act from a strategic point of view. From this point of view, complex schemes, equipment performance with low indicators may be the right options, which should be evaluated in mining processes, the process of maximizing the value depends on the use of the mineral. . deposit. In summary, the open pit mining system includes equipment such as a tension loader, greatly improves the production cycle of the loading and transportation stage, and the productivity of the open pit loading system is further increased. A high-voltage charger not only provides effective independence of both. A shovel and a truck probably give more freedom of choice, and the power of the truck acts as an intermediary in controlling the complete rotation of the load. The shovel and truck mounted on the loader serve to maintain a certain consistency in their dimensions. A high-tension forklift allows for simplified truck routing, which speeds up material handling by reducing maneuvering time. In addition, the material unloading system of the tension loader allows control of the filling ratio and trucks, which increases the efficiency of the loading process. For these reasons, the new cycle used by the tension loader not only separates the shovel cycle from the truck cycle, but also improves the loading and transport phase. Planning mining processes in an open pit and determining the dimensions of the mine boundary.

### Conclusions

The process of designing mine exploitation schemes in open pit mining is one of the complex activities at depth. For this, it is necessary to know the parameters that control the operation. Experience and the mine planner's engineering knowledge are key to creating designs that solve problems. The main goal of creating value depending on the parameters of the mine and the implementation of restrictions depending on the performance. This article explores the concept of mining schemes in open pit mining and offers a wealth of knowledge and skills. However, since optimization models can represent design goals, operational constraints must be considered. Further research can be aimed at finding existing and new mathematical methods that can be useful for optimization, which will greatly help in the design of exploitation schemes in open pit mining.

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