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OPEN PITS PRODUCTIVITY CONTROL ALONG WITH IRON ORE PRODUCTS DEMAND VARIATION

One of the most important conditions for any deposit efficient mining is justified determination of its operational capacity. At that the productivity of ore mining refers to strategical design solutions, which are very hard to be changed in case of necessity.

Operation in the contest of market economical relations puts mining plants in dependence on global mineral market situation, which is characterized by significant variability over the last ten years. Therefore when mines operate with a constant operational capacity, there are additional expenses related to storing of unsold final product in warehouses- in the period of demand decrease. Plants also lose the opportunity to increase the profit when demand is increased due to impossibility of production active intensification to cover the market demand. Due to that the objectives of local mining plants have been changed. Ensuring of competitiveness which depends on mining strategy became a priority.

Under these conditions the productivity of mine is to be adjusted to varying external conditions during its entire life time. It means to increase economical efficiency of mining is possible by implementation of flexible changes in mining volumes when demand is varied. The productivity is to be managed at the level of one open pit or group of them which belong to one Plant as well as at the level of Company Group with one owner in order to get the maximum profit. If the Plant owns several mines than the productivity of each one is to be defined based on the best performance of Plant.

Mineral demand increase brings to production volume increase (at that there is no change in stripping ratio). Demand decrease causes mining volumes decrease, equipment, buildings and facilities downtimes, manpower reduction, and equipment utilization time decrease. At the same time in order to decrease production cost the stripping ratio is decreased. However, the current methods for mining opera-

tions planning don't include any changes in mine productivity for ore extraction within long periods of deposit development. In addition there are no mechanisms for justified selection of open pit production capacity and operation mode, considering their interrelation along with iron ore demand variation. As a result, there is a delay in stripping operations, unscheduled temporary non-operational walls generation because of failure to follow the law of well-proportioned operations and mine development, and also, generation of temporary non-operational walls in operational zone which is unacceptable. Therefore, it is necessary to adjust mining operations to variable market conditions.

Due to that the productivity reallocation method, when iron ore products demand is varied, was developed for the group of open pits which are the part of one mining & benefication plant. By the example of Annovsk and Pervomaysk mines which belong to Severnyi GOK, there was ore mining productivity reallocation done without any changes in general strategy for final product production. In order to adjust ore extraction productivity to product demand increase or decrease, it is first required to define the mine maximum productivity based on mineral availability and also economic possibility, i.e. investments availability for plant capacity increase. In this case for each open pit there can be defined a scope of possible operation options which includes two ultra ones:

Mine operation with minimum stripping ratio and low ore extraction productivity.

Mine operation with maximum ore extraction productivity and high stripping ratio.

Within the possible options for ore extraction productivity and mining operation mode the best option of their combination is selected for long or entire period.

Iron ore concentrate demand can be decreased or increased. Therefore, apart from the strategy for ore extraction and concentrate production, defined by Design Institute, changes of net present value (NPV) based on concentrate production enforced changes for both cases were studied. At that, the issue of ore extraction productivity set level achievement was first considered, taking into account the current condition of mining operations in open pits and also operations mode change depending on ore extraction productivity change.

Ore mining productivity reallocation between Pervomaysk and Annovsk mines just by 1 m. in favor of Pervomaysk mine will allow increasing the profit of Severnyi GOK by 96 m.UAH. It is proved that the best reallocation for Severnyi GOK is the option when Pervomaysk mine operates with the maximum productivity and Annovsk mine ensures productivity of 9 m.t/y which is required to complete the strategy of Plant.

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DETERMINATION OF THE BOUNDARY CONTOURS OF THE OPEN-PIT MINE TAKING INTO ACCOUNT THE TRANSPORT PARAMETERS

Presently, the task of determination the boundary (end) contours of an open-pit mine is solved by comparison of the economic stripping ratio and incremental, the average, and / or current stripping ratio. This measure was introduced in the mid-twentieth century due to the complexity of the calculations associated with determining an economically viable depth of the surface mining by calculating the mining costs.

The introduction of these factors was aimed at simplifying the calculation of the limit depth of surface mining. It was assumed that the economic stripping ratio is constant. Various ratios were adopted for the development of soils and rocks as an exception. With this in mind, it should be emphasized that the economic stripping ratio value depends on the actual production cost of an extracted mineral, overburdened rocks and the acceptable production cost of an extracted mineral (for example, the cost of underground mining).

The academician Rzhevsky V.V. emphasized that the expenses for transportation of rock mass influence the increase in production cost of mining rocks with expansion of mining depth [1]. He noted that with the change of mining depth the error in calculations of deposit mining cost makes 3-15% and may not be taken into account. How-