

Modern Exploitation of Minerals, Precondition of Capitalism of Mineral Resources

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Abstract- Mining technology, in the last 15 years has dramatically changed in the region and world in general. Globalization of Mining Industry, determine the change in technology and Mining methods too. In every stage of mining production the work is mechanized, highly productivity and electro-hydraulics machineries are required. Underground mining workshops, regardless of mining methods, most of the cases are required previous prepared access deposits which are specified from the easy and fast access of mechanism in the working place. For Metal Mines in Kosovo, application and usage of ramp is becoming useful to make it easy to access in different workshops.

Ore bodies in Mines of Kosovo have their own specifics. We deal with large, medium and small ore bodies, which are followed by instable head roofs. This sometimes makes it impossible to focus on modern exploitation techniques, so this fashion of exploitation offers possibilities to increase mining intensity. In this paper we are focused on access deposits and planning exploitation, drilling mechanism, blasting, safety at working place, primary transportation and horizontal transportation.

Key words: Mine, mining methods, technology, planning and production.

I. INTRODUCTION

Determine of mining ore bodies and contact boundary of rocks and ore body influence in mining methods selections, filling the stopes, also the contact boundary of rocks and ore body influence in aspect of decreasing this required intensity of mining. Application of hydraulic fill, replacing back the waste material from processing and flotation is an advance work. For highly and efficient productivity, is required the modern mechanism application in all stages of technological processes of underground mine exploitation. Drilling machines Jumbo with two booms electro-hydraulic working system, enable drilling holes 4m length by diameter over 500mm. Charging drilled holes with explosive, because of the large number of holes and the amount of explosive that will be used, is the most critical stage in the last and closing cycle. Training of the personnel and engineers on using ANFO explosives will be able to assessment low cost and efficiency required.

Underground mining loading machinery LHD diesel has high capacity and is compatible with modern equipment and machinery for drilling and blasting. In this paper we are focused on drilling mechanism, charging holes, scaling and cleaning meaning that the workshops must be safe, and final stage is loading and hauling. And will be given recommendation and its effects.

II. ACTUAL SITUATION IN KOSOVO'S MINES

Lead and Zinc orebodies are exploited in Trepça Mine - Stanterg in Kosovo since 1930.

Collected records for the mining production per each year realized, shows that in 1990 from Mines in Kosovo are exploited 61,871.000t mineral. The largest amount of minerals exploited from Trepça Mine – Stanterg is approximately 61% or 36,000.000t. Geological reserves determined by old methods in the last 90s are evaluated to be 45.604.000 t. In the last two years, all lead and zinc deposits are examined in aspect of geological potential form international and national experts are depended on regulations by CMMI. Geological reserves of a deposit are handling as a dynamic category, in a functional relation from metal prices in the market, from the exploitation cost and processing cost. All these variables accumulate in the lower limit of metal ore (Cut-off-grade) that have to be mined. Starting from the evaluations which are done recently, only 4 Mines of lead and zinc in Kosovo fulfill the required criteria for a successful job and are presented on the Table 1.

TABLE I
PROFITABLE MINES IN KOSOVO

	Mines	Metal Zn _{eqv}
1.	“Trepça” – Stantërg	643.760 t
2.	Artana	83.520 t
3.	Hajvalia	745.200 t
4.	Cërnac	103.680 t

Our Mines in Kosovo are oriented only in production of concentrate then forwarding to international market for further processing.

In these Mines are evaluated that we would have a good performance and effective work if we could activate metallurgical capacities, as well. Primary goal is that mine always has to work if there is a profit, and the obligation are given to engineers who deals with ore exploitation and ore processing. An engineer, every each working day have to be able to know which Block of ore is planned to be exploited, and easily can be classified as ore before exploitation or as a waste material. This classification might influence in the exploitation cost of ore. This is the fact that in Kosovo's Mines has to advance and be modernized on purpose to increase the productivity from 0.8t/worker/shift up to 2.5t/worker/shift.

III. ACTUAL TRENDS

Nowadays, mining science are integrated in a world global system known as WWM (World Wide Mining). This means that each mine if wants to manage successfully underground mineral resources from its sector which possess a licence for research and exploitation absolutely have to obey the rules which are approved by world global system. The particular mine might possess large geological reserves, could be processed in a good fashion, but if the ore exploitation has no profit then this is not considered as potential. The primary goal in a mine is profit. Rapid development of computational and geostatistical techniques has followed complete digitalization trends of a deposit. Geostatistical methods faithfully enable that obtained information from geological research's to attach the mining units or saying in other words small blocks of ore, this can be shown in figure 1. The size of smallest blocks is one of the characteristics of the deposit and could be determined by Kriging method. All this information's which regulated or repositioned in a computer represent main data of a deposit.

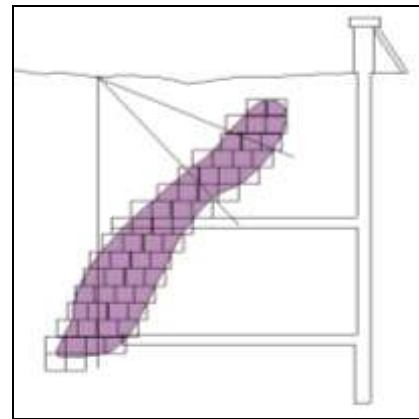


Fig 1: Divided mining units of a deposit

Computational modelling of a workshop, workshop design, design of access workings of deposit and required calculation, requires too much work by an engineer in this field of designing.

What kind of mining method is going to be used, depends on ore body geometry, from geological conditions, properties and characteristics of accompany rocks and from other factors, as well. The design of mining method and accesses of a deposit moreover is becoming suitable for application of machineries which reach high productivity. In lead and zinc Mines of Kosovo, are used two mining methods:

- Cut and Fill Mining Method
- Sublevel Caving

In the modern approach, both of these mining methods are suitable for machineries with high productivity in all stages. Cut and Fill mining method is employed in Trepca Mine – Stanterg since it is opened. From historical data, can be stated that this mine has worked with the low productivity from 0.8 to 1.1 t /worker/shift. If we evaluate this issue in aspect of increase of profit, the low productivity, will not be acceptable if we compare mines in the world which employ the same mining method as we do in our Mines in Kosovo despite the fact that in Kosovo the work force is very cheap.

Previous calculations show that the reached rate productivity 3.5-6t /worker/shift is acceptable limit. New concepts for underground mining in all stages of mine are as following:

- Vertical preparatory works (ventilation and hydraulic fill shaft)
- Application of mechanics with high productivity (drilling stage, charging drilled holes, loading and haulage transportation)
- Driven and opening of a ramp (driven of ramp enable connection between levels, this purpose is to come faster to the working place)
- Hydraulic fill of workshops (this is done by waste material,

- Previous Sampling of each workshops and planning of blocks for exploitation.

The number of workers is reduced for 3, 5 times.

IV. MECHANISM AND COMPARED EFFECTS

Modern mechanism for underground mining workings, last year's absolutely has changed the working concept. Drilling machines are mobile machines, these machines have two booms which quickly take position for drilling through servo hydraulic system control. In the boom are placed hydraulic hammers, where the percussive force is replaced with pushing hydraulic force. Drilling machines such as Drifting Jumbo has a large mobility, so that quickly could be moved from a working face to another. These machines are represented in figure 2.



Fig 2: Pneumatic drilling machine



Fig 3: Hydraulic drilling machine

So, for particular conditions of each mine can be found special drilling machine. Pneumatic drilling machines are more suitable for some special condition in a particular underground mine. The experience of using these drilling machines in Trepca Mine – Stanterg, shows that better effects are reached from drilling machine Jumbo with two booms, with hydraulic hammer and with diesel motor. The last stage of the mining is loading and haulage in a workshop and is known as LHD technique. These loaders are compact, their dimensioned are not large and are suitable for underground workings, and are presented in figure 4.



Fig 4: Loading machine LHD

The dimensions of the loading machines enable to be fast and work with efficiency to load the broken ore from working place. Main mining transportation which in the classic technology is done by locomotives. Mine transportation depends on the underground mining conditions and this could be conditioned by high cost comparing with modern mine transportation system such as mining trucks, their capacity is 15-40t.



Fig 5: Transportation truck

Underground mining trucks are shown in figure 5; the dimensions of underground mining roads should be 9m². If a mine has a high production capacity could be used two or more trucks. In modern mines, except these machines can be used other machines which have impact on increase of high productivity: ANFO mixing system, hydraulic pick hammer and raise bore machine. Definitely, we may sum up that modern mines have to be supplied with a set of machines such as: Jumbo Drilling machine with two booms, Scoop Tram loading machine with capacity 1.5m³ and mining truck with volume 5m³.

All in all, the whole mechanism can reach the average production of 250.000t/year, 24 workers may work per shift and 42hrs per week. In Kosovo taking into consideration the high rate of unemployment we can employ the required mechanism of productivity 2.5-5 t/worker/shift.

V. PREPARATORY WORKS

Modern mechanism require a modern access of underground mining infrastructure and other operations that have to be finished and also additional and services works in the production stage. Ramp can be driven to join different horizons in underground mines, in that way to reach the

workshop quickly means the distance between workshop and ramp to be minimal. The ramp is constructed with inclination max 15 degree, and this inclination is defined by characteristics and properties of rocks. It is preferred that the ramp to be able to connect 2 or 4 workshops. Within each constructed ramp should drive a vertical or incline shaft, which serve as ore bin. Hydraulic fill of workshops is becoming necessary wild is applied underground mining method cut and fill. Researches have to be made considering characteristics and properties of rock and have to be determined the time of drainage of hydraulic fill and the last stage have to be placed in a good way. Physical and mechanical properties of final strata of hydraulic fill determine the type of heavy mechanism that have to be worked there. General cross section of a mining method is shown in figure 6.

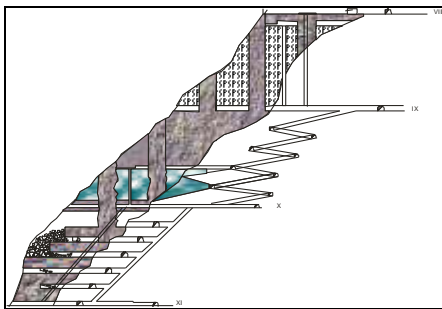


Fig 6: Mining method in Trepça Mine

Access of max time in a workshop after hydraulic fill, is not preferred to pas 7day. Production mechanism (drilling machine, loader) are engaged in production stage and driving the ramp. Good synchronization of production stage of ore, fill stage of workshop and advance stage of driving types of mining opening, are indicative factors of good organization of mine workings and there is a guaranty for a successful work.

VI. COMPUTER OPERATING OF PLANNING PROCESS

Efficiency exploitation and profitable mineral resources, means usage of computer operating, as we do planning for long time and planning for shifts, days and months. Modern mine has no need to be supplied with any system of special computer. It's enough that the responsible offices of mine are equipped with computers. Connection network is preferred.

Strong hardware device have to be found in offices of geologists and engineers of planning. These offices also required to have additional hardware: laser printer, colour A3 printer, LaserJet printer (A0xL), digital table, surveying suitable equipment by needed hardware and software and also package of Data Mine programme. Database of the mine, require a serious project and planning. Database of metal content in small blocks designed in ore bodies. Divided small blocks could be with different dimensions, determined by geostatistic data, collected database from the secondary

sampling in the workshops, before and after mining stage, collected database for the incoming ore in flotation, database of deep drilling from the surface, database of deep drilling done in the mine.

In figure 7 are presented only the relation of data's to make operative plans in a mine. These plans, with full coordination of planning sector and geological operating sector.

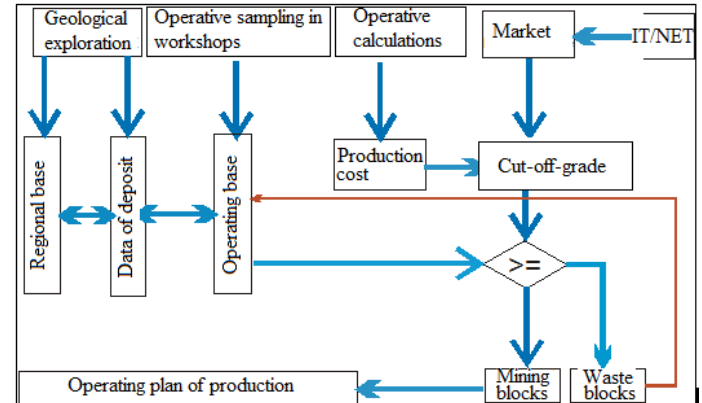


Fig 7: Organization according to operative plans

From an engineer is required to know very well the deposit and the orebodies in that deposit, geological conditions, and having knowledge on computer programs in a way that his/her work to be finished quickly and precisely.

VII. CONCLUSION

Actual trends and the fact that the market is arbiter of mine existence, imposition the whole change of classic approach of working in mine. Through this study an idea comes to our mind that the person who plays an important role is the Miner. The miner has professional knowledge, and has to be aware of his personal safety and colleagues in general and also paid well comparing with others. Each person who works in a mine have to follow the following responsibilities:

- Each mine, face to the high rate of potential risk which in every moment can risk the life of miners and the equipment. Safety in underground mines is a key factor. Like a worker and/or an engineer is obliged to be aware of safety in an underground workings.
- Second priority, is the ore grade which will be produced. Conditions in a market, in a clear way determine the cut-off-grade parameter. An engineer is obliged to determine the ore and waste material per a particular deposit.
- The quantity of the produced ore was a prime priority. In new conditions, this parameter is considered as a second hand parameter, but every time is related with realization of production stage with predetermined quality.
- From this analysis we understand that if a calculation is lower the limit of Cut-off-grade, influence on increase of cost.

In Mines of Kosovo, only with such an approach has a real chance to reactivate and to establish new condition of business. Other approaches which belong to the past absolutely must not use yet.

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