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- ○ Other:

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Compare Methods of Fix Lead, Milawa NPV and Milawa Balance Algorithm in Optimizing the Production of Open Pit Mines with Whittel Software

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Abstract

Long-term production scheduling of open pit mines is among the issues affecting the profitability and management of cash flow of mining projects. In order to obtain optimum net present value, first the optimal final point and push backs are determined and then the production scheduling is done. In this project, the optimum long-term production scheduling in the Taft copper mines project with the aim of maximizing the net present value using specific Milawa algorithm and Whittle software was performed. This research was conducted with the aim of determining the final range and production scheduling of two copper mines of Ali Abad and Darre Zereshk in a way that the net present value of the project is maximum, for this purpose, Whittle software version 4.4.1 was used that this software using Milawa algorithm specifies the optimal net present value during the time periods of mining that the best state is the use of Milawa NPV method that by using it, net present value NPV of pit mine of Darre Zereshk (with copper price $700 ton and interest rate 10%) was obtained $26 million with stripping ratio 1.9 and net present value of pit mine of Ali Abad was obtained $176 million with stripping ratio of 1.3.

Keywords

Milawa Algorithm, Stripping Ratio, Push Back, The Final Pit, Cash Flow, Whittle Software

1. Introduction

Optimizing temporal and spatial schedule of production to the parameter of the "net value of production at the present time", today, is accepted as one of the most common strategies of management of mining projects. Under this approach, the main purpose of production scheduling is the return of investment as soon as possible after the start of extraction [1].

Depending on production scheduling, a number of factors including the availability of materials and equipment, expand pit and prices of goods in production scheduling come together to reach the goals set by managers of the mining companies. Software Whittle is used for strategic scheduling of mine and optimizing economic of extracted projects of open pit mines [2].

In this study, the optimal production scheduling in the project of Taft copper mines with maximization strategy or net present value is considered. A sequence of mining resulting in the highest net present value is the same as in most cases such as the present project should be selected.

2. Methods and Tools for Data Analysis

2.1. Using Whittle Software and Mathematical Modeling

First, basic data collection from the mines and most importantly block model and converting parameter files and block model by software Surpak and importing file of block model into the Whittle software, then the production of nest pits and optimum final range of pit mines due to the limitations and analysis of nest pits by using 4 algorithms used in Whittle include: Milawa algorithm with two aims of maximizing net present value and making balance for annual production, the use of fix lead mode where it is specified that to start the extraction in a push back must be extracted several step from the previous push back and in the fourth method that user can determine the extraction of the various parts of the pit and then choosing optimal pit and push backs and optimal strategic production scheduling with Whittle software and at the end, is sensitivity analysis and possible changes needed and interpretation of results and reporting software.

2.2. Production Scheduling in Whittle

When a category of push back was selected, the next step is finding a good program: when each block must be extracted in the block model.

Whittle in fact not used for extraction of unique block but collects the blocks according to every push back and each block, so production scheduling studies are reduced with the initial blocks conversion to per step in each push back.

2.3. Production Scheduling with Fix Lead Method

In this method a push back is set and to next push back is continued with a certain number of work steps. The main drawback of this method is that recognizing the relationship between intervals is not possible for a compound of push backs. One of the features of fix lead method is that by increasing work steps, scheduling in the best mode will be close and closer.

As we see in the Figure 1, using this method, the extraction rate per year is unlikely to remain constant, but may be in the best mode of close [3].

2.4. Production Scheduling Using NPV Milawa

This algorithm is based on maximizing the net present value in mining and delays the time of stripping production as much as possible while producing mineral is kept constant and also decide how deep a push back will be extracted to start the next push back that is based on maximizing discounted value of mine [4].

The main advantage of this method is that it gives us the closest scheduling by the best mode and production scheduling but the disadvantage of this method is that production can be highly variable, *i.e.* during the diagram between the periods that scheduling is designed for the more delay of stripping production and overall extraction rate is different [5].

2.5. Production Scheduling by Balancing Algorithm of Milawa

This algorithm is used to balance in the annual production and is similar to Milawa NPV method, but the best balance is in terms of capacities of mine and capacity of factory. If we use this method, we see that the stripping materials will be extracted in the early years with a fix rate and in all years Asia will be filled, but the net present value will not be too high as it should be.

Figure 2 is related to the results of scheduling by Milawa algorithm.

3. Discussion and Conclusions

After the nest pit was selected among optimal nest pits, the level and sequence of extraction of materials within this range should be determined. The process is the same as before, except that in this part, production scheduling for several years of mine life and only for a pit (final pit) is performed. At this stage, production scheduling is performed based on Milawa algorithm, or fix lead mode or

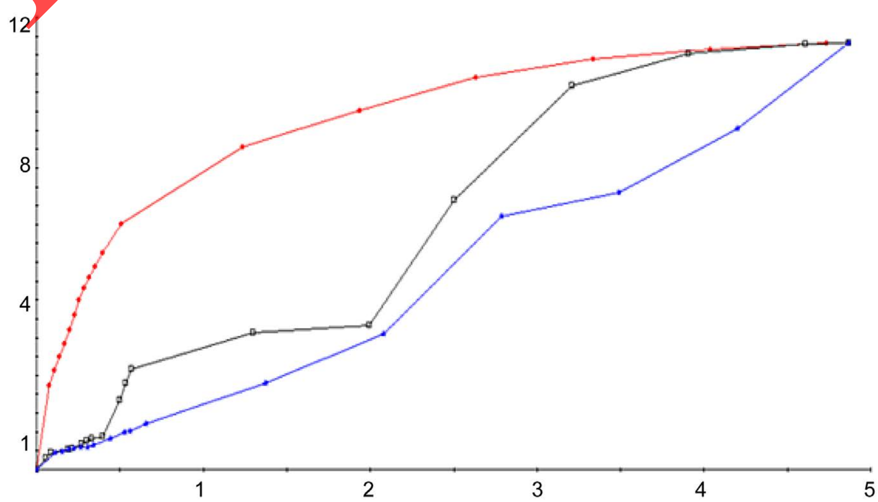

Figure 1. Figure of stripping ratio to mineral for mine of Darre Zereshk by fix lead method.

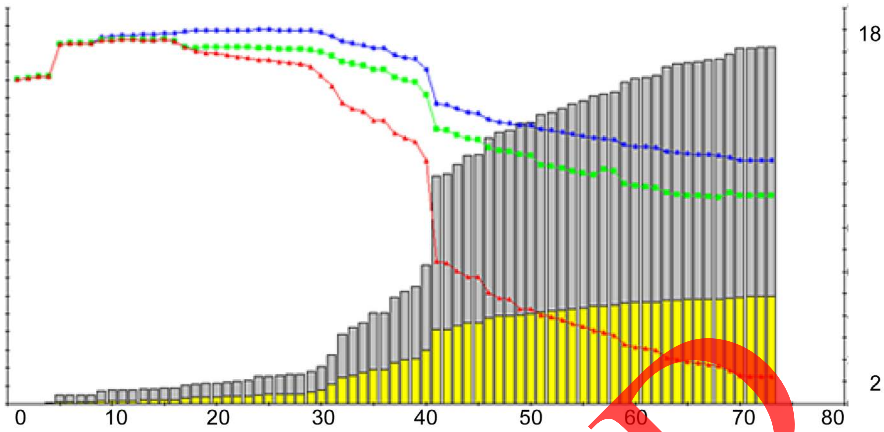

Figure 2. Graph related to results of scheduling by NPV Milawa algorithm for mining of Darre Zeresk.

in a sequence that the user defines and push backs are selectable in three modes of automatic, semi-automatic or manual.

With regard to profitability of optimization of production scheduling in pit mines, this method can be used in the open pit mines of country. Further, the results of the analysis show that: 1) The amount of extractable storage of Darre Zereshk mine was obtained 123 million tons (the mineral and stripping material) and for Ali Abad mine about 112 million tons was obtained. 2) The amount of extracted mineral from Darre Zereshk mine in the first-7 year was scheduled 50 million tons and from 8 to 13-year, 50 million tons and in the last 4 years, 23 million tones (in three stages) and for Ali Abad mine, in the first-8 years 50 and for the second-8 years, 62 million tones (in two stages) was scheduled. 3) Darre Zereshk mine life was obtained 17 years and Ali Abad mine life obtained 16 years from graph node of scheduling. 4) Darre Zereshk mine stripping ratio was 1.9 and for Ali Abad mine was 1.3. 5) Net present value of the optimal pit of Darre Zereshk mine was obtained $26 million and for Ali Abad mine obtained $176 million. 6) These results were almost equal with the results obtained from previous research that was done by the software of datamine on Darre Zereshk copper mine [6] [7].

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References

[1] Vallee, M. (2000) Mineral Resource + Engineering, Economic and Legal Feasibility = Ore Reserve. *CIM Bulletin*, **90**, 53-61.

[2] Froyland, G., Menabde, M., Stone, P. and Hodson, D. (2004) The Value of Additional Drilling to Open Pit Mining Projects. In Orebody Modelling and Strategic Mine Planning—Uncertainty and Risk Management. The Australian Institute of Mining and Metallurgy, Perth, 169-176.

[3] Whittle, J. (1989) The Facts and Fallacies of Open Pit Optimization. Whittle Programming Pty., Ltd., Victoria.

[4] Lerchs, H. and Grossman, F. (1965) Optimum Design of Open-Pit Mines. *Transaction CIM*, **58**, 47-54.

[5] Wilke, F.L. and Reimer, T.H. (1979) Optimizing the Short-Term Production Sche-

dule for an Open-Pit Iron Ore Mining System. *Computer Methods for the* 80'*s in the Mineral Industry*, *Society of Mining Engineers of AIME*, 12, 642-646.

[6] Johnson, T.B. (1969) Optimum Production Scheduling. *Proceedings*, 8*th International Symposium on Computers and Operations research*, Salt Lake City, 24 January 1969, 539-562.

[7] Williams, C.E. (1974) Computerized Year-by-Year Open Pit Mine Scheduling. *Society of Mining Engineers*, *AIME*, *Transactions*, **256**, 45-52.

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