

https://dspace.org/

Cut-off grade optimisation for a bimetallic deposit: case study of the Ruashi Mine Copper-Cobalt deposit

Mugwagwa, Daniel

2017

http://hdl.handle.net/10539/23514

Mugwagwa, Daniel (2017) Cut-off grade optimisation for a bimetallic deposit: case study of the Ruashi Mine Copper-Cobalt deposit, University of the Witwatersrand, <http://hdl.handle.net/10539/23514>

Downloaded from a DSpace repository. https://dspace.org/

ABSTRACT

The research was driven by the need to optimise the Ruashi Mining operation to prevent further high-grading without destroying the value of the mine. Ruashi Mining incurred a five-year stripping backlog caused by the drive to reduce costs. As a result of this, a decline in metal production was imminent in the subsequent years. The study was conducted mainly using SimSched Direct Block Scheduler (SimSched DBS) in comparison with schedules from Datamine Net Present Value Scheduler (NPVS) and MineSched. The scenarios investigated have shown that running a mine based on break-even cut-off grade does not optimise the net present value of an operation as shown through the results of Ruashi Mining. The research also proved that royalty affects the cut-off grade for Ruashi Mining, and cannot be ignored.

The proper scheduling of wasting stripping resulting from cut-off grade optimisation has contributed to a timeous exposure of high grade to avert the decline in metal production. All the three scenarios have shown that high grade ore can be availed on time, thus producing a smooth metal output for the life of mine.

Cut-off grade optimisation is very crucial for any mining organisation as it is the main driver of value. Ore reserves are important in the determination of a company's share price. High cut-off grade results in fewer reserves, and vice versa. Since mineral reserves are the source of revenue, therefore, the higher the reserves, the higher the revenue. Low cut-off grade may result in the processing of material that does not give high profit at the beginning of the life of mine. This, therefore, lowers the mining company's net present value. This makes it imperative to optimise the cut-off grade during the mine life in order to optimise the net present value.

During mining operations, there are various stakeholders whose interests must be considered during cut-off grade optimisation because they derive many benefits from the mine. These stakeholders include shareholders, employees, government, the community and non-governmental organisations.

Cut-off grade optimisation has shown that there is an opportunity to improve the net present value of Ruashi Mining. SimSched gives a higher net present value (NPV) compared to the current Ruashi life of mine schedule. This indicates that SimSched can be used to improve the NPV for Ruashi by producing an optimised schedule. It is important to note though that there

is need for the software to have provisions to take into account the initial stockpile status so that there is a holistic approach to the schedule optimisation.

The grade-tonnage curve is steeper closer to zero implying that a small change in cut-off grade has a huge impact on reserves. Based on the results of the study it was clear that optimisation in SimSched DBS results in a steeply declining cut-off grade policy compared to NPVS. In addition, optimisation in SimSched leads to highly accelerated mining rate and massive stockpiling.

Royalty is a cost which has to be incorporated in cut-off grade optimisation. The study has shown that the cut-off grade for Ruashi is increased by 19.8%. Ignoring royalty may result in overvaluing of an operation. Environmental considerations favour the optimisation of the use of the mieral resources. Consideration of environmental costs lowered the cut-off grade for Ruashi by 16%.