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Abstract

The Application of Cut-off Grade Principles to Enhance Mineral Resource Profitability - Orapa Mine Case Study

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Given the importance of optimizing exploitation of finite Mineral Resources, looking for opportunities to unlock value and increase profitability, previous researches have shown that the application of cut-off strategies improve profitability. Despite the vast research and application, the cut-off policy deployment is still under-researched and not fully exploited in diamond resources. Constant breakeven grades still prevail and inform the Life of Mine plans.

This study investigates the impact of the application of cut-off policy in diamond resources. For this purpose, an Orapa Mine case study was adopted, research objectives accomplished through qualitative and quantitative data collection and analysis. The main hypothesis proposes that the application of the cut-off policy increases profitability while the second research determines the optimum cut-off grade (COG) to inform strategic stockpiling and mining optimisation.

The research reveals that there is an unexplored/missed opportunity of applying cut-off strategy to drive Orapa Mine resource profitability. The breakeven COG for Orapa Mine is 15.83 cpht while the breakeven cut-over grade is 38.27 cpht. These assume a weighted recovery efficiency of the existing processing plants. The optimum COG lands at 31.34 cpht. Overall, the current conceptualization further reveals that the optimizing strategy results in 77% higher Net Present Value (NPV) and 11% increase on profits relative to the original constant breakeven grades. The declining cut-off grade calculated with depreciation, minimum profit and General and Administration costs further improves the NPV and the undiscounted profits. It further reveals that the cut-over grades for optimum stockpiling philosophy and processing for the Orapa plants will increase value. The study recommends the adoption of cut-off strategies and a cut-over criterion to enhance profitability.

Keywords: Optimization, cut-off policy, breakeven, NPV, opportunity cost, strategic stockpiles.