

https://dspace.org/

Unlocking value through improved production decision making : a trackless mining systems analysis

Mukonoweshuro, Christopher

2018

https://hdl.handle.net/10539/26923

Mukonoweshuro, Christopher (2018) Unlocking value through improved production decision making : a trackless mining system, University of the Witwatersrand, Johannesburg, https://hdl.handle.net/10539/26923

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

ABSTRACT

This study was based on the hypothesis that there are opportunities to maximize production outputs in many existing underground hard rock trackless mining systems using the same or less resources by improvement in decision making paradigms. This is very important in the current operating environments of uncertainties and continued drop in metal prices.

The project main goal was thus to carry out a detailed investigation of trackless mining production systems and test how to maximize output by focusing on three objectives, namely: analyzing key technical factors that impact the production rates in terms of tons per hour, identifying major operational activities which impact effective equipment operating hours, and identifying decision support systems (DSS) to improve operational decision making.

Regarding the first objective (production rates), through the analysis of trackless mining as a serial production system, it was shown that production rates could be increased by focusing at system level, process level and work station/equipment level decisions. System level decisions must minimize the total residence time of the material (ore) in transit or work in process(WIP). This will open capacity for generating more ore. Process level decisions must reduce the gross cycle times at the work stations to equal or be below the Takt times inorder to smoothen production flow. Takt time is an important factor in a production system which shows the maximum cycle time allowed to meet the daily demand. The third level focuses on the capability of the mining equipment itself through decisions that improves the reliability, maintainability and capacity. Decision tables based on reducing the equipment failure rates (λ), improving the repair rates (μ) and the cycle times were developed to aid in making the reliability, maintainability or capacity decisions.

For the second objective (operational activities), the focus is to maximize effective operating times of the equipment through reduction of delays. The study shows this can be achieved through use of real-time decision support systems (DSS) for better control of the operations. The third objective was able to identify functional modern DSS that can be implemented in trackless mining.

Effectively, the study was able to highlight opportunities of generating extra capacity for trackless mines at same or less resources by focusing on the above three objectives.