A Mathematical Model for Real-Time Ore Flow Optimisation from Uncertain Resources to Run-of-mine Stockpiles and Processing Plant

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# ABSTRACT

Ore flow refers to the systematic movement of extracted ore from the resource through various stages, including transportation, storage, and processing. Effective management of ore flow is critical for optimising resource utilisation, minimising operational costs, and enhancing the economic viability of mining operations. However, achieving optimal production scheduling is complicated by the dynamic and uncertain nature of the mining environment. The absence of the research on integrating advanced ore-tracking technology with real-time ore flow optimisation models further hinders real-time ore flow optimisation. To generate optimal production schedule dynamically and consider the entire mining value chain, a dynamic linear programming (DyLP) model that integrates Radio Frequency Identification (RFID) technology with linear programming (LP) is developed to optimise the ore flow from uncertain resources to the run-of-mine (ROM) stockpiles and processing plant. The objective function of the DyLP model is to maximise the net present value (NPV) of the mining project and minimise the production deviation between schedule forecasts and actual outcomes. This dynamic approach allows the static mathematical model to adapt to real-time conditions, offering a significant advantage over traditional static scheduling methods. By tracking the ore flow, RFID tags will deliver real-time data on actual ore flow and thus enable real-time updates to the production schedule. The proposed model considers the ore flow through the entire mining value chain, forming a direct connection between individual mining processes to the ultimate objective. An iron oxide copper-gold deposit located in central South Australia serves as a case study to validate the applicability and effectiveness of the proposed model.