STRATEGIC MINE PLANNING UNDER UNCERTAINTY

STOCHASTIC OPTIMIZATION FOR STRATEGIC MINE PLANNING: A DECADE OF DEVELOPMENTS

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Conventional approaches to estimating reserves, optimizing mine planning, and production forecasting result in single, and often biased, forecasts. This is largely due to the non-linear propagation of errors in understanding orebodies throughout the chain of mining. A new mine planning paradigm is considered herein, integrating two elements: stochastic simulation and stochastic optimization. These elements provide an extended mathematical framework that allows modeling and direct integration of orebody uncertainty to mine design, production planning, and valuation of mining projects and operations. This stochastic framework increases the value of production schedules by 25 %. Case studies also show that stochastic optimal pit limits (i) can be about 15 % larger in terms of total tonnage when compared to the conventional optimal pit limits, while (ii) adding about 1 0% of net present value to that reported above for stochastic production scheduling within the conventionally optimal pit limits. Results suggest a potential new contribution to the sustainable utilization of natural resources.

Mine planning, stochastic optimization, geological uncertainty, simulated annealing, production scheduling