

CASE STUDY

Simulation model identifies production constraints to increase production and extend the LoM

Mining Method
Underground

Project Approach
Simulation

The Customer

A gold and copper mine based in southeast Asia sought to increase production from its underground mine.

The Challenge

At current production levels, the mine faced the prospect of its viable operating life being less than a decade. Mine managers wanted to determine if an increase in production of more than 60 per cent was achievable.

This would allow the mine to reduce its reliance on its low-grade surface stockpile, increase the head grade of the ore sent for processing and operate its onsite processing plant at full capacity for an extended period. Overall, this would enable the efficient and effective utilisation of the company assets.

The Results

Polymathian worked with the mine planning team to deliver a comprehensive analysis that identified the operational constraints and highlighted the potential for increased production. Following a site visit and regular communication with the client's planning team, a comprehensive discrete event simulation model to analyse the throughput capacity was developed.

Discrete Event Simulation Capability

Discrete event simulation enables customers to evaluate system performance within a digital environment and discover the likely range of system outputs when inputs are variable.



Assess Constraints

Discrete event simulation model to assess constraints



Validate Production

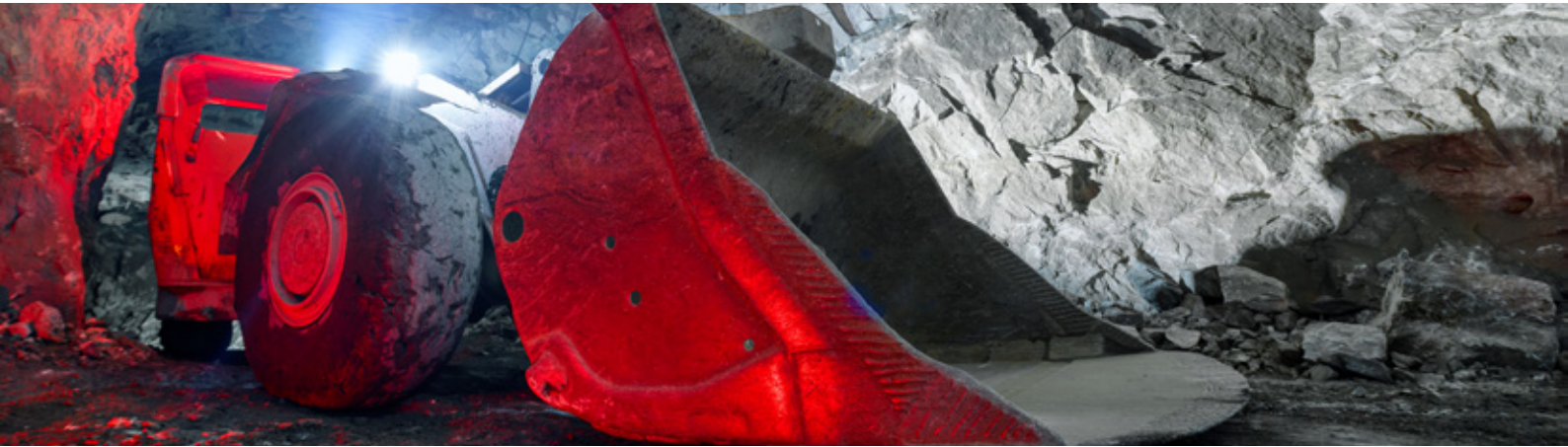
Confirmed feasibility of plans to achieve a 60% ramp up in throughput



Support Life of Mine

De-risked mine life extension of 8+ years





This involved a theory of constraints based process and a detailed representation of the mining operation to evaluate the actual bottlenecks occurring at the mine.

In collaboration with the client and using the proprietary software solution Deswik.SCHED, a series of mine plans were developed, successively adding practical limitations to an initially unconstrained mine plan. This process was used to develop an understanding of the effect of equipment fleet, backfill rates, geotechnical limitations and other development-metre or tonnage constraints applied to the mine plan on production capacity once the schedule was resource-levelled. At the end of this process, an updated mine plan was established to target the production goals.

In the second phase, further analysis with the simulation model was conducted to consider equipment movement and interactions. This process took into account the dynamic nature and variability of mine operations, such as traffic congestion in the mine decline and the effect of equipment interactions on production. Detailed modelling of the operations was used to establish that the updated mine plan was feasible and achievable. Over and above the results of the study, the outcome accelerated plans for a step-change production increase, instead of the planned incremental staged rises.

The process took about two months to complete.

The Benefits

The simulation modelling and analysis provided insights for the mine planners on how to achieve their desired uplift in production. The complex analysis used a first-principles representation of the mining operation. This identified a requirement for increased equipment fleet size and highlighted infrastructure improvements that would support additional production. Importantly, it also revealed which infrastructure upgrades were unnecessary to achieve the target throughput.

The simulation also identified mine infrastructure upgrades that could extend production beyond the current goals.

Across the two-stage assessment, Polymathian was able to verify the feasibility of a significant increase in production. This would increase the head grade and approximately double the viable mine life.

Decision Support

The simulation model helped answer business critical questions such as:

- How to reduce reliance on low-grade surface stockpile?
- What increase in performance is actually achievable?
- What are the constraints in the operation?
- What fleet size is needed to achieve tonnage targets?