

CASE STUDY

Significant increase in NPV for Underground Metal Mining Operations

APEX

Mining Method
Sub-level open stoping

Module
Strategic

The Customer

The customer is one of the world's largest mining companies with operations in over 30 countries including world class iron ore, coal, copper and zinc assets.

The Challenge

The customer operates one of the world's largest underground metals stoping mines. Producing detailed and practical long-term mine plans for large stoping operations is an extraordinarily complex planning task.

There are over 80,000 individual tasks that need to be scheduled: 50,000 stoping related tasks and 30,000 development related tasks spanning a mine life exceeding 40 years, and hundreds of constraints that plans needs to conform to, including:

- ventilation restrictions
- waste, rock and paste fill production and fill capacity
- production and development drilling capacity
- mill tonnage and grade constraints
- resource category constraints
- task dependency and lag timing constraints

The customer was already using what is generally considered to be two of the leading mine planning and mine design tools on the market. These existing incumbent tools however do not include any sophisticated numerical optimisation techniques capable of automatically producing optimal solutions for problems of this scale and complexity.

Producing solutions using these tools can be inordinately time consuming, trying to satisfy all constraints, whilst keeping up production tonnes to the mill is often impossible, and maximising value is a completely manual task.

About APEX

APEX optimises the LoM / Strategic schedule for complex mining operations. It maximises NPV considering mining tasks, resource consumption and constraints.



The Value



Maximise NPV

+30% Increase to NPV



Optimisation

Generate optimal strategic plans



Scenario Plan

Rapidly generate scenarios with ease





The Solution

After making a number of stope scheduling specific enhancements, Polymathian deployed the strategic mine planning module of APEX, a cloud-based mining optimisation decision support toolkit, to solve this extraordinarily large and complex planning problem. APEX is capable of automatically producing solutions without the need for any manual guidance that:

- are extraordinarily detailed, explicitly scheduling all 80,000 production and development tasks
- enforced more than 230 separate detailed planning constraints
- obeyed all precedence constraints and corresponding timing lags
- produce optimal solutions using an exact numerical optimisation technique
- maximises NPV

The Benefits

APEX has increased the NPV of the mine by more than 30% when compared to the best possible solutions produced by the incumbent mining software tools, an outstanding result for the client.

Decision support

- What development tasks should be prioritised to unlock mining areas?
- How do changes in a resource fleet impact overall production targets?
- What stopes should be prioritised to maximise the Net Smelter Return?
- Which mining constraints are binding and where are the bottlenecks?
- Which mine design yields the highest net present value?