



**orelogy improves UG
project value by applying
Pseudoflow to the LOM plan**

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The Challenge

In underground projects with complex operations and mining activities, a traditional Cut-off-Grade (COG) can be difficult to determine.

How do you ensure the economics of all mining excavations maximise your projects undiscounted cash flow?

How do you subsequently identify mining areas with higher profit margins and bring them forward in your LOM schedule to maximise the projects discounted cash flow?

The Solution

orelogy utilised Pseudoflow (Deswik™), which employs an algorithm similar to the Lerchs-Grossmann process used in Open Pit optimisation, in the economic analysis and scheduling phases of a UG LOM plan to overcome these challenges.

The Result

With the application of Pseudoflow, the overall undiscounted Cash Flow for the Project was improved by 5% and, more importantly, the Discounted Cash Flow (DCF) for the LOM was increased by 12% (Discount rate 8%). Furthermore, the DCF is increased by 38% and 31% in the first 3 years and 5 years of LOM respectively.



Project Context & Challenges

The Case Study Operation:

- 1.6 Mtpa with >10-year mine life.
- 15+ orebodies.
- Remnant mining areas at shallow depth.
- New mining areas at >2000 m below surface.

Complexity created cost estimation challenges:

- Some remnant stopes require longer rehab development and
- some remnant stopes require additional rock-fill consolidation.
- Haulage costs vary greatly due to significant variation in elevation in each orebody.
- Therefore, traditional Cut-off-Grade (COG) is difficult to determine due to these variations within and between mining areas.

Value-based scheduling challenges:

- Multiple areas could start mining concurrently – with limited resources, which areas should start first?
- Previous schedule sequencing was based on ranking of individual orebodies with higher/lower priorities – how to determine priority when there is a large range in value within each orebody?

Our number one goal is to unlock the true value of your mining project



Pseudoflow application

The Solution

- Apply Pseudoflow in the economic analysis of the mining areas to maximise the project net undiscounted cash flow.
- Use the Pseudoflow results to identify and prioritise the high profit margin mining areas and improve the project Net Present Value (NPV).

What is Pseudoflow?

- Pseudoflow is a type of network flow algorithm that is faster than the traditionally used Lerchs-Grossmann algorithm. It is a more efficient (processing time/power, and input parameter setup) method.
- It is used to find and select solutions in open pit and underground mine design and scheduling that prioritise profit improving NPV and cashflow.

When used for Underground mine planning, it can

- Evaluate all planned excavation economics to determine the “Ultimate UG Design”.
- Generate a Free Cash Flow guidance using a Revenue Factor approach that can be used to identify the sequence priority for scheduling.

Ask orelogy
how we can
apply
Pseudoflow
to add value
to your
Underground
projects
today?

For the Project, an alternative outcome using a traditional COG methodology was generated to allow the results of the Pseudoflow approach to be assessed.

Key outcomes were:

- The overall Undiscounted Cash Flow is improved by 5%.
- The Discounted Cash Flow (DCF) for the LOM is increased by 12%.
- The DCF for the first 3 years is increased by 38% and 32% for the first 5 years of the LOM.

SCENARIOS	LOM (M\$)	YEAR 1-3 (M\$)	YEAR 1-5 (M\$)
Undiscounted Cash Flow			
COG Approach - Auto Levelled Schedule	\$1, 545	\$180	\$376
Pseudoflow Analysis - Auto Levelled Schedule	\$1, 615	\$249	\$527
Final LOM Schedule with Pseudoflow Analysis - additional manual constraints	\$1, 615	\$250	\$492
% Variation from COG Approach	+5%	+39%	+31%
Discounted Cash Flow (8% Discount Rate)			
COG Approach - Auto Levelled Schedule	\$872	\$151	\$288
Pseudoflow Analysis - Auto Levelled Schedule	\$985	\$208	\$405
Final LOM Schedule with Pseudoflow Analysis - additional manual constraints	\$973	\$208	\$380
% Variation from COG Approach	+12%	+38%	+32%

note:
additional manual constraints not applied to cog scenario



Other applications

What mine planning activities benefit from the application of Pseudoflow?

- Quickly evaluating, comparing, and selecting mine designs based on value.
- Enabling value as a scheduling parameter.
- Economic optimisation in Life of Mine, Ore reserve Estimations, and mine project studies.
- Sensitivity and scenario studies.
- Mine plans and schedules with large data sets and complex constraints.

Find out how orelogy can add value to your project through

- Unique & superior technical solutions.
- Focused and agile consulting team.
- A partnership with clients to intimately understand their needs.

**Contact orelogy,
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