MINE TWIN
CASE STUDY

VALIDATION OF ALTERNATIVE RAILVEYOR IMPLEMENTATION SCENARIOS

THE OBJECTIVE

To simulate and validate the **technical design** of a project implementing a flexible autonomous rail haulage system (Railveyor®).

Tasks included:
- Calculating **mine productivity** for various stages of life of mine using the Railveyor system
- Identifying **bottlenecks** for different haulage configurations (dead-end, looped, etc.)
- Determining the **optimal number** and technical parameters of Railveyor trains
- Evaluating overall **mining efficiency** after implementation of Railveyor system

THE SOLUTION

Simulation scenarios were created **for key stages of life of mine**.

The model replicated Railveyor **dispatching and scheduling** logic along multiple routes, accounting for:
- Train interactions at **passing loops**
- Movement in **loading and unloading areas**
- Different **routing schemes**

Optimization studies determined the **best capacity** and **fleet size** for Railveyor trains.

Integration with the mine's **geological information system** enabled **automated scenario generation**.

THE RESULTS

- **The initial Railveyor layout was refined**. At later stages of mine development, an additional branch track was required for bypassing.
- **Technical parameters** of the Railveyor trains were **simulated and verified** to support future design justification.

THE CLIENT

A research and engineering company specializing in mining.

Project Context

The project involved modeling the mine infrastructure and Railveyor operations for multiple stages of life of mine.

Each stage included:
- Validation of design assumptions and fleet sizing based on productivity and availability criteria
- Simulation of Railveyor movement considering:
  - Haulage speed on mainlines
  - Speed during loading/unloading
  - Train and wagon parameters
  - Individual route layouts
  - Interaction at passing points
  - Speed reduction on curves and acceleration on straight sections
- Scenario-based study using simulation modeling and interpretation of results
- Detailed performance analysis with 2D and 3D visualization of Railveyor operation

Additionally:

- MineTwin was integrated with the mine's geological information system to enable automated scenario generation.
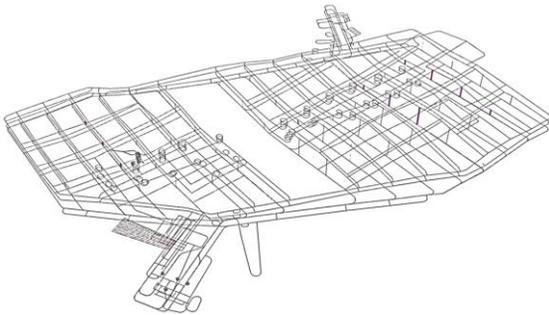
Key Questions

Simulation in MineTwin was aimed to answer:
- Are the design assumptions valid?
- What Railveyor fleet is optimal for achieving production targets?
- How many trains are needed at each stage of mine development?
- Is the overall haulage system capacity sufficient?

Study Mode

MineTwin's "Study" mode and fleet analysis helped identify operational patterns for production improvement, such as automatic calculation of Railveyor train parameters and their impact on productivity.

Impact of Railveyor trains length on annual mine production
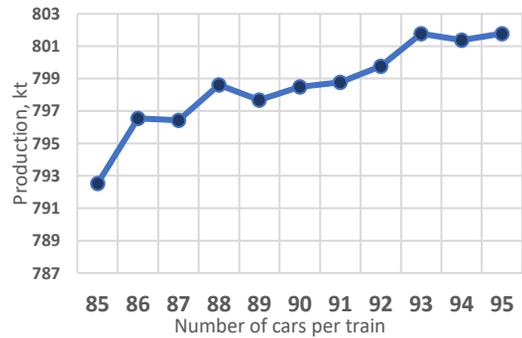
Why MineTwin

Designed specifically for mining:

Unlike generic simulation tools, it accurately reproduces operations of both open-pit and underground mines.

It models detailed equipment interactions within cyclic or continuous haulage systems, capturing nonlinear constraints and dependencies invisible to Excel or linear programming.

Bridging strategic planning and operational control:

MineTwin verifies plan feasibility considering equipment availability, geological conditions, and operational constraints.

Scalable and adaptable:

It enables creation of an internal competence center to develop models for multiple mines on a unified platform.

MineTwin is flexible enough to adapt to different mine layouts and process configurations.

After implementation, internal teams can independently run scenario analyses, optimize fleet configurations, and evaluate operational changes — supporting continuous improvement and well-grounded investment decisions.

MINE TWIN

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What Is MineTwin?

MineTwin is a configurable, simulation-based decision support tool designed for both underground and open-pit mines. It captures the majority of operational constraints and interdependencies found in real-world mining environments.

How MineTwin Works

MineTwin builds a simulation model—a high-fidelity digital representation of an actual mine's operations.

It is the only platform on the market that integrates discrete-event simulation with linear programming and combinatorial optimization, enabling the creation of realistic digital twins of mines.

Discrete-event simulation

Linear programming

MINE TWIN

Combinatorial optimization
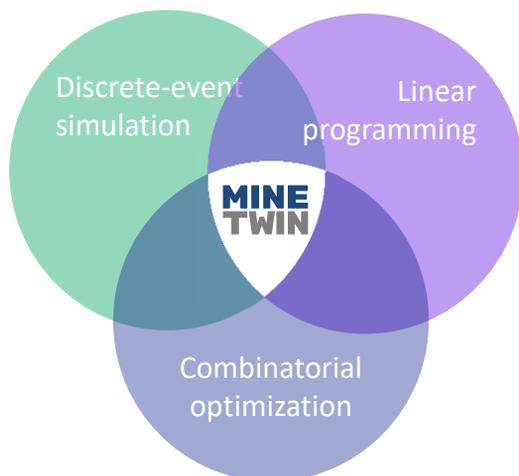
What Tasks Is MineTwin Best For?

Check the **feasibility of mining plans** and evaluates the impact of improvement initiatives by using a dynamic model of mining operations. Able to capture non-linear factors like queuing, dynamic ore pass stocks, coordination standby delays, etc.

Provide the means for **comparison of several potential future states** of an existing or future mine. Estimates the operational and financial KPIs of every option.

Provides the scenario analysis functionality for determining **equipment fleet configuration and size**.

Allows mine planners to verify and adjust plans and schedules based on **foreseen bottlenecks** (lack of mining fronts to work in, insufficient blasting frequency, ore and waste flows imbalance, insufficient backfill rate).

Learn More

Visit us at https://minetwin.com

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Mine Twin

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