

Polymathian: Supply Chain Optimization in the Mining Industry

Case Study

Learn how a decision support tool – built by Polymathian and powered by the Gurobi Optimizer – enabled a leading global mining company to generate optimal strategic plans that increase profit margins by 5%.

Polymathian: Attaining Visibility and Control over the Mine-to-Market Supply Chain

To maximize throughput and profitability, global mining companies must be able to attain visibility, alignment, and agility across their mine-to-market supply chains.

Achieving this goal is a significant challenge due to the complexity of these supply chains, which:

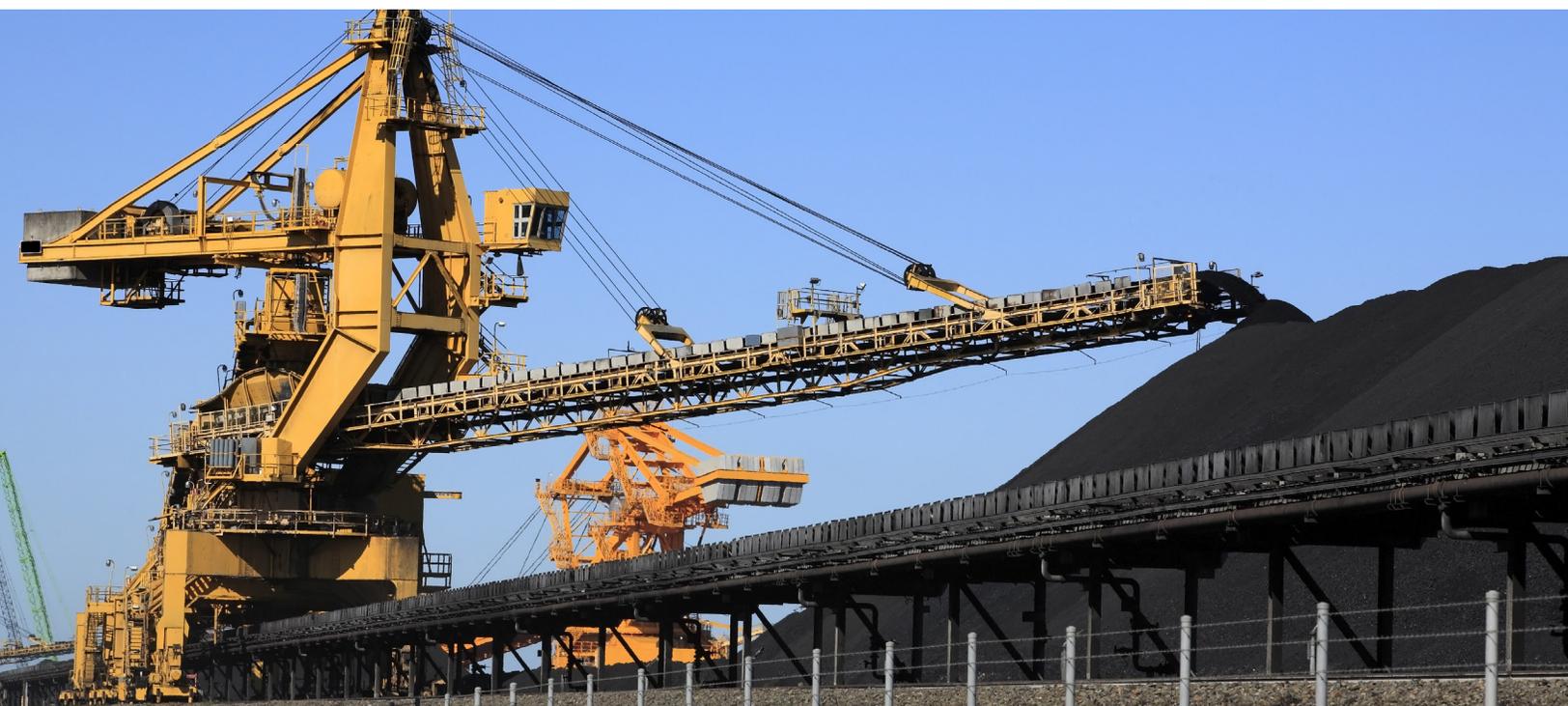
- Encompass multiple sites across sprawling operational networks,
- Involve numerous steps including mining, refining and processing, stockpiling and blending, and rail, port, and marketing operations, and,
- Churn out a diverse portfolio of products, which must be delivered to customers around the globe at specific times and according to certain specifications.
- Are impacted by volatile supply and demand dynamics, which can cause bottlenecks and surging operating costs.

To cope with this complexity and drive greater efficiency and bottom-line growth, mining companies must be able to generate integrated plans that optimally match supply and capacity with demand.

Indeed, optimal planning and decision making – at the strategic, tactical, and operational levels – is the key to transforming the mine-to-market supply chain into a source of competitive advantage.

The team of executives who oversee a leading global mining company's coal mining operations in Queensland, Australia (which consist of multiple mining complexes, rail networks, and terminals) rely on their plans to make decisions about how to manage their end-to-end supply chain.

Their strategic plans, for example, are used to predict their long-term capacity needs and constraints, determine the right product mix, and decide on how to allocate raw materials to blends.



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Until recently, the global mining company's planners were utilizing manual techniques and tools including Excel to create these strategic plans on a monthly basis. Utilizing this time-consuming manual planning process, it was not possible to generate strategic plans that:

- took into account their multi-year customer contracts and complex blending opportunities across sites;
- provided end-to-end supply chain visibility over a multi-year time horizon and balanced supply and resource utilization with demand;
- maximized throughput, efficiency, and profitability across its Queensland mining operations.

With the aim of enabling this type of strategic planning, the global mining company decided to invest in and deploy an automated, advanced planning and decision-making software solution powered by mathematical optimization.

The Solution: Automating and Optimizing the Strategic Planning Process

To provide an automated, advanced planning and decision-making tool, the global mining company turned to Polymathian— an Australia-headquartered firm that specializes in developing and delivering state-of-the-art mathematical optimization software solutions was engaged.

To address the global mining giant's strategic planning challenges, Polymathian deployed one of its software solutions called BOLT – a web-hosted and cloud-based decision support tool that has been used by companies across numerous industries to optimize their complex multi-site and multi-modal supply chains. BOLT, like all the other solutions in Polymathian's portfolio, is powered by the Gurobi Optimizer (the world's fastest and most robust mathematical optimization solver).



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Since going live, BOLT has given the global mining giant the capability to:

- automatically collect, integrate, and process all relevant real-time data from across its operational network;
- generate – in a matter of hours – optimal, data driven strategic plans that cover a time horizon spanning from five to 30 years and take into consideration all relevant mine-to-market supply chain dynamics and constraints;
- rapidly perform what-if analysis on each strategic plan to explore numerous scenarios and assess their potential impact on business objectives, evaluate tradeoffs, identify strategic risks and opportunities, and determine the best courses of action; and
- accurately forecast demand and make optimal strategic decisions in a wide range of areas including:
 - how to calibrate the company’s operations – including mining, refining and processing, stockpiling and blending, and rail, port, and marketing operations – to satisfy demand while minimizing OPEX;
 - how to best utilize capacity and allocate raw materials;
 - how to determine the right product mix and marketing strategy; and
 - how to manage CAPEX and conduct maintenance operations and plant upgrades.

“BOLT has revolutionized and optimized the strategic planning and decision-making process of this global mining company,” said Tao Vink, Manager at Polymathian, “With the implementation of this new solution, the global mining company’s team is able to automatically generate and dynamically revise optimal strategic plans. These plans give them visibility and control over their entire mine-to-market operational network (now and in the future) – so that they can make the best strategic decisions when it comes to resource allocation, investments in infrastructure and maintenance, take-or-pay contracts, and more. BOLT serves as the single source of truth for all matters related to strategic planning and decision making.”



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The Results: Improved Efficiency and Profitability

By enabling automated, optimal strategic planning and decision making, the implementation of BOLT has helped the global mining company conquer the complexity of its mine-to-market supply chain, maximize end-to-end visibility and efficiency, minimize costs, and optimally match supply and capacity with demand over the long haul.

With BOLT, the global mining company has been able to realize numerous business benefits including:

- **Greater Profitability:** 5% improvement in gross margins by making optimal product mix and blending decisions based on forecasted demand and capacity capabilities and constraints.
- **Reduced Planning Cycles Times:** Reduction in the time it takes to produce a strategic plan – from a week (before the implementation of BOLT) to a matter of hours now.
- **Increased Strategic Planning Horizon:** Now executives can generate strategic plans with a time horizon of up to 30 years. Using Excel, the global mining giant was only able to create strategic plans with a five-year time horizon.
- **More Rapid, Robust Scenario Analysis Capability:** Now the global mining company can automatically and quickly produce numerous what-if scenarios – and dedicate more time to analyzing and evaluating these scenarios to help drive optimal strategic decision making and business outcomes.

Why Gurobi?

Polymathian decided to embed the Gurobi Optimizer in BOLT – as well as the other products in its portfolio – because it is the best-of-breed mathematical optimization solver.

The world's fastest and most powerful mathematical optimization solver, the Gurobi Optimizer is capable of tackling just about any business problem – regardless of how huge it is in scope or high it is in complexity – and generating an optimal solution.

The Gurobi Optimizer's industry-leading performance and cutting-edge functionality make it uniquely capable of handling the challenging multi-site, multi-modal supply chain problems that BOLT is used to address.

“To manage a massive mining industry supply chain such as this global mining giant's operational network in Queensland, you must be able to solve complex, large-scale business problems stretching across a 30-year time horizon and involving millions of variables and constraints – and you need a state-of-the-art mathematical optimization solver to do that. The Gurobi Optimizer – which has incredible mathematical problem-solving power – is up to the task,” remarked Tao Vink.

