CASE STUDY

Using simulation to maximise throughput in a complex mining value supply chain

The Customer

The customer is one of the largest mining companies in the world with significant operations in Australia. They were planning to open a new mine situated upriver from an ocean loading barge-vessel transshipment location.

The Problem

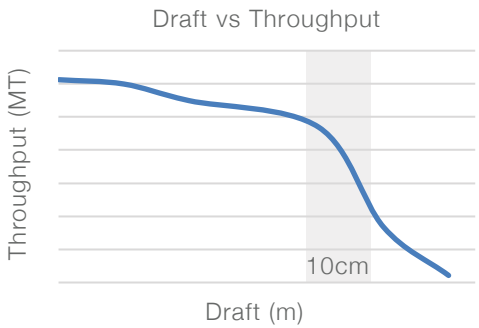
The customer needed to evaluate the materials handling throughput of a complex, tide bound river system. Transporting material using barges via a river to an ocean loading transshipment location was the only way that the customer was able to export material from a planned new mine.

Manually calculating the throughput of the river was complicated by the state dependent dynamics of the river system. The timings of barge journeys are impacted by tide height at multiple river bars and congestion. Upstream and downstream barge passing is limited to a few locations on the river and governed by a set of strict rules.

The customer also wanted to understand how the number of barges in the barge fleet affected throughput and operating efficiency of the system. Simply operating more barges would not necessarily result in an increase in margin, due to the high operating expense of each barge and the increased risk of congestion from operating a larger barge fleet.

The Solution

Polymathian worked closely with the customer to build a detailed discrete event simulation tool that could simulate the river system and barging operations over a 5 year period. The outputs from the tool were detailed enough to show every journey of each barge for a five year period, including when barges were waiting for tides, waiting to pass, traveling and loading / unloading. This rich data output made it possible to undertake detailed analysis of factors that impacting system throughput.



Significant decrease in throughput found with small variations in draft

Business Function

Materials handling logistics

Planning Function

Mine planning

Product

Simulation

The Benefits

The simulations were able to demonstrate that a fleet of two barges provided more than the minimum required throughput of the river system and that three barges had a diminished return on investment.

The data driven design of the simulation tool made it possible to measure the impact on system throughput of different types of barges.

The physical design of the barges, specifically a 10cm variation in barge draft, resulted in a critical decrease in predicted annual throughput to below the minimum required. This small increase in draft meant barges would have to wait more frequently and for longer periods to navigate over the tidal river bars. This critical finding enabled the customer to consult with barge engineers to ensure designs met this key constraint.

Design to delivery: 3 weeks

Scoping	Simulation Development	Analysis
3 days	2 weeks	1 week

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