# CASE STUDY

## Using simulation and optimisation to minimise downtime in a complex conveyor belt system

# GEAR

**Type**
Maintenance and Asset Strategy

**Module**
Parts and Inventory

### The Client

A major iron ore producer, our client operates in Western Australia's resource-rich Pilbara region, where most of the country's iron ore is mined.

### The Challenge

The client runs a complex and extensive network of conveyor belts to transport iron ore from the mines into the processing circuit. The network, involving hundreds of belts ranging in length from a couple hundred metres to 20 kilometres, plays a crucial role in the profitability of the company.

When a belt wears thin or tears, getting operations back online depends on how quickly that belt (in whole or in part) can be replaced. Ordering belts after a breakdown is not an option; delivery can take up to four months. Instead, the client prepares for planned and emergency maintenance by keeping safety stock of belts in their warehouses. Since the belts that make up the transport system are of varying widths, thickness and materials, the amount of safety stock is considerable, and costs well into the millions of dollars.

Different belts move different amounts of material so, in terms of operational downtime, some replacement exercises are more costly than others. To mitigate risks and loss of productive revenue, the client needed a way to be certain they were carrying the right type and amount of inventory.

### About GEAR

GEAR is a prescriptive maintenance tool that uses industrial mathematics to optimise scheduling of maintenance events while adhering to asset management strategies, resource and budgeting constraints, and safety thresholds.

### The Benefits

**~ 50%**
Reduction in risk of downtime

**Digital Twin**
Powerful scenario planning capability

**Rapid Delivery**
Production ready in four weeks

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**Type**
Maintenance and Asset Strategy

**Module**
Simulation

## The Solution

Polymathian deployed a powerful tool that used a combination of simulation and optimisation to provide a highly detailed level of insight and decision support. Running scenarios on a virtual replica of their systems demonstrates how different variables impact production. The results of the simulations are fed into an optimiser which identifies the best scenario and enables the client to make decisions that satisfy their objectives.

## The Result

In just four weeks, the client had a tool that gave them a deeper understanding of their conveyor belt network and the system it serves. At any time, the client can now log into the tool to test their theories as scenarios. The optimiser compares results, uncovering optimal solutions supported by quantitative data.

## The Benefits

The tool demonstrated how, by increasing their CAPEX by 15 percent, the client could achieve a risk reduction of nearly 50 percent. This and other data-supported findings are being presented to higher management to request an increase in the client's warehousing and safety stock budget.

**Decision Support:**

- How will allocating an additional X percent to our safety stock budget impact risk and production?
- Taking into account budget or warehouse space constraints, what is the ideal amount of each material that should be kept as safety stock to ensure minimal disruption to productivity?
- What impacts on total production would there be if there were different mean times between failure of belts per site?
- How much stock would we need to carry if the lead times to replenish the belts were to change?

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