Enhancing Operational Insight to Improve Planning and Effectiveness at Mine X

Project Approach:

Background Research
1. Mine X operations investigation, **stakeholder** input, **mining cycle** scope definition and **literature** review.

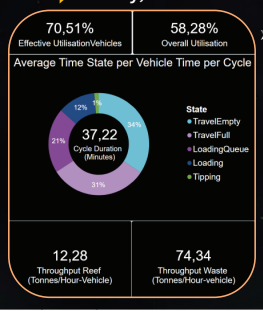
Context Analysis
2. Work breakdown, **data cleaning**, data **modelling**, and simulation **process planning**.

Prototype Modelling
3. Basic **process design** and testing **experimental dispatch** techniques were designed in the prototype model. The **neural network algorithm** **improved total throughput by 8,95%**.

Base Model Simulation
4. A **benchmark simulation** with PowerBI dashboards for model **calibration** and **control**.

Operational Simulation
5. Four simulated three-month production plans predicted **throughput** and enabled operational **insight**.

Verify, Validate and Test Results



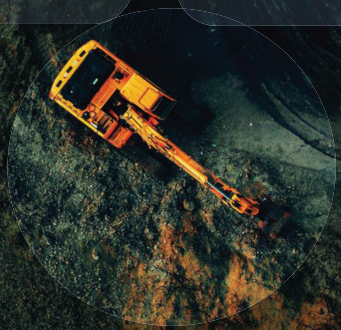
- **PowerBI dashboards** were designed from model outputs. The visuals were utilised to **verify**, **validate**, **and test** (VV&T)the simulation's **outputs against actual** mining performances. Visuals were designed for **loading and tipping locations,** as well as for **vehicles and excavators**. The visual to the right is a partial display of the vehicle Power BI sheet.

The Problem:

Mine X utilises a **throughput prediction** to determine throughput for the upcoming three months of production. The throughput prediction became unreliable, impacting long-term planning and financial budgeting. Furthermore, Mine X lacked sufficient **insight** into the causes of poor production and solution techniques to improve production rates.

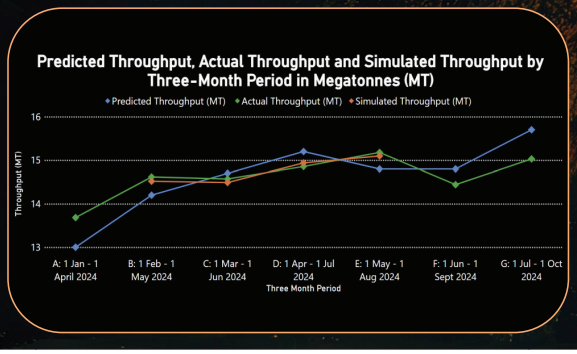
The Solution:

A data-driven **simulation model** was designed to simulate operations at Mine X. Through precision modelling and PowerBI dashboards, the **throughput prediction** measure was improved whilst providing simulated **insight** into medium-term operations.



Conclusion:

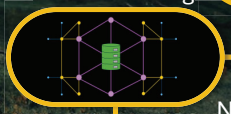
The **total throughput** prediction of the simulation model averaged a **12,03% improvement** over Mine X's prediction, and the **reef throughput** prediction was **improved by 18,07%.** This enables more accurate throughput estimations whilst ensuring future operational **insight.** Below is a representation of the throughput prediction **simulated against the actual** throughput and Mine X's predicted throughput.



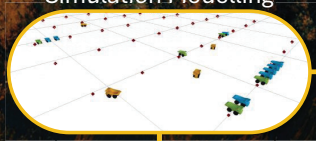
Industrial Engineering Techniques:

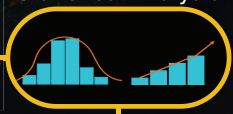
Process control


Data Cleaning


Data Modelling


Neural Networks


Simulation Modelling


Statistical Analysis


VV&T


Project Sponsor:

4sight | SIMULATION

Dunbar K, 2024