

Case Study: Helping BHP better understand the complex Copper Solvent Extraction and Electrowinning processes at Olympic Dam, using AI

Challenge

To determine the root cause of copper cathode dendritic growth and pre-stripping at Olympic Dam

Approach

Data Science was applied to several years of photos and time-series plant data from sensor measurements and sample laboratory assays - the 6 month project included

- Site visit to meet the team and tour the plant
- Thorough understanding of the process, the data, and the problem
- Extraction of data from process historian database
- Fortnightly sprints and meetings with the site operations team
- Data analytics
 - Correlation analysis
 - Mutual information analysis
- Data visualisation
- Machine learning
 - Unsupervised
 - Supervised
 - Multiple algorithms
- Regular feedback from site operations team
 - Metallurgical interpretation of findings
 - Agreed direction of sprints
- Reporting
 - Fortnightly progress updates
 - Final documentation



Consilium Technology's Ben Schultz and Andy Harris at Olympic Dam

Findings

Key learnings included

Dendritic growth events were reliably modelled from primary indicators, which themselves were reliably modelled from plant data

- Interpretation of models determined drivers for problematic increases or decreases, which may avoid dendritic growth
- Solvent conductivity consistently increases as scrubbed solvent copper decreases, and as iron, uranium oxide, and bromine increases - chlorine also increases conductivity, perhaps bringing entrained solids which contain unanalysed problematic elements
- Phase disengagement times increase with chlorine (spent scrub and strong electrolyte) and uranium oxide (spent scrub)

Pre-stripping was modelled accurately

- Increases correspond with increases in the electrowinning filtration area chloride tenor and lower PLS temperatures, which both indicate potential contaminant entrainment
- AWS provided the required elastic computing power and storage for data processing and model training

Benefits

BHP gained

- Confirmation of technical team's theories around drivers for process excursions, enabling improved focus to continue prioritising existing project workstreams
- Practical demonstrations of what is possible with Data Science
- New ways of visualising data using Python plot libraries, far beyond the limitations of Excel plots
- Trusted AI partner for future process investigations

"The Consilium team was great to work with"
 Tim Thomson, Technical Superintendent at BHP Olympic Dam