

OPTIMISING REAGENT USE IN CLAY HOSTED RARE EARTH EXTRACTION

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ABSTRACT

Understanding what makes a project profitable in the design phase is crucial. We usually rely on existing data for benchmarking, but in this case, due to limitations on what data was available, we supported an extensive bench and pilot test work campaign with AR3 to create cost estimates and designs. As a result of our approach, our main focus in flowsheet development is finding ways to reduce operating costs, particularly by recycling reagents. This approach involved using a data science approach to quickly test different scenarios and pinpoint what drives profits the most.

Project background

AR3's Koppamurra project is a large clay hosted rare earths prospect in Southeast South Australia. The mineral resource is 186 Mt at 712 ppm TREO and contains valuable magnet elements Nd, Pr, Dy, and Tb which are essential in high strength permanent magnets used in wind turbines and electric vehicles. WGA have been supporting AR3 for three years, starting with drilling data management, then metallurgical test work program management, and now through to cost estimation and preliminary engineering. To make sense of the flowsheet economics, we need to understand what drives profitability. We needed to define what are the big levers that will make a project profitable over the life of operations.

Methodology

Typically, we rely on existing plant design and operating costs to do preliminary 'back of the envelope' cost estimates. But a lot of that information isn't available in Australia or the West.

So given we need a flowsheet to evaluate project profitability, and we have limited or no access to benchmarking data, we supported AR3 in conducting a comprehensive test work campaign, with over 300 bench scale tests and a pilot operation at ANSTO, SGS Lakefield, Bureau Veritas, and University of Toronto, to understand the process set points. From this we developed the flowsheet and cost estimate based on the met test work and pilot results.

There's several moving parts to the profitability calculation, but we want to focus our efforts to get the most impact during flowsheet design, so we developed a multi scenario analysis to rapidly assess a number of scenarios to identify the big levers. We automatically run thousands of cases to identify the most profitable scenarios with the support of the WGA data science team.

We've run multiple scenarios to increase profitability using these levers, but operating costs remain the biggest lever, so that's why we're focusing on minimising and recycling leach and impurity removal reagents in flowsheet development in our ongoing support of the AR3 project.

Outcomes

Our integrated team of process engineers and data scientists were able to collaborate with AR3 to develop a comprehensive mass balance model and profitability analysis to focus flowsheet development, with the objective of reducing time to commercialisation.

Keywords: clay hosted rare earths, profitability, economic analysis, pilot operations