

Sustainable Minerals Institute

CAPABILITY STATEMENT



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE



Mineral processing

The Sustainable Minerals Institute (SMI) at The University of Queensland applies advanced mineral processing and geometallurgical expertise to develop solutions that boost production while supporting decarbonisation and sustainable processing pathways. Our capability spans laboratory testwork, pilot-scale validation, and plant implementation.

The mineral processing and geometallurgy researchers at SMI's Julius Kruttschnitt Mineral Research Centre (JKMRC) work closely with the geology specialists at the WH Bryan Mining Geology Research Centre (BRC) to develop a well-rounded view of how ore geological characteristics influence circuit behaviour.

This bespoke, integrated approach places strong emphasis on interpreting the ore properties in context, which ensures the findings are meaningful and translate into clear, actionable insights for plant design, optimisation, and value improvement.

SMI's JKMRC has access to established testing infrastructure, including its pilot plant in Brisbane and partner-level access to the FlexiLab pilot-scale facility at the Resources Centre of Excellence in Mackay for circuit testing and validation.

Our experts combine ore characterisation with cutting-edge research in mineral processing and metal production to provide diagnostics, modelling, testwork programs, and professional development. SMI's JKMRC also developed the JKSimMet and JKSimFloat modelling platforms.

The JKMRC's latest lab rigs include the JKHFmini for coarse particle flotation, an L150 Jameson Cell rig, a magnetic dense medium cyclone, and an integrated comminution and classification unit.

About The Sustainable Minerals Institute (SMI)

SMI is the world's largest co-located interdisciplinary research institute focused on minerals and resources. Through its seven specialist research centres, international centre SMI Chile and technology transfer company JKTech, SMI works to have a positive impact on global mining and sustainability challenges.

SMI delivers:

- Integrated, research driven solutions to advance industry best practice.
- Research driven training and higher degrees by research.
- Innovation for a sustainable future.



Top 5

UQ is consistently ranked in top 5 in the world for mining and mineral research.



300+

SMI has over 300 researchers working to solve mining and mineral related challenges.



600+

SMI has partnered with over 600 industry, government and civil society organisations.



5+

SMI delivers research and training in South America, Europe, Africa, Asia and Australia.

Our approach

SMI's tailored, trouble-shooting approach to mineral processing includes:

- Integrated geometallurgical and process modelling linking ore characteristics to circuit performance across comminution and flotation.
- BRC's geological characterisation integrated with mineral data and metallurgical testwork to create spatially predictive models that link orebody characteristics to processing performance.
- Electrochemical characterisation, which can serve as a proxy for flotation behaviour.
- Process water characterisation, as residual reagent accumulation can affect recovery rates.
- Comminution tests, modelling of force distribution and liberation via rock characteristics.
- Tools and workflows to integrate metallurgical results with geological databases.
- Developing small scale continuous processing units for rapid evaluation of critical mineral and tailings reprocessing flowsheets.
- Advanced Automation Solutions: model-based soft sensors (JK MillFIT, JK VMillFIT, JK CycloPS) to infer hard-to-measure process variables across grinding circuits, and a dynamic model for materials-handling to track materials information (JK Stockpile Dynamic Model).
- Deploying high voltage pulse (HVP) and similar technologies for pre-weakening and improved liberation and ore sorting.
- High temperature processing modelling and design for critical minerals and metal production.
- Meta-analysis of minerals processing safety incidents to uncover causes and improve performance.
- AI-based technologies for advanced automation and process control.

Impact highlights



Participation in ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals

The Centre aims to transform the minerals sector by:

- Reducing energy and water use during mineral processing.
- Increasing mineral recovery during mineral processing.
- Training a new generation.



FlexiLab: upscaling mineral processing for critical and strategic minerals

- SMI researchers designed the Future Industries Hub FlexiLab in Mackay, a flexible pilot-scale mineral processing facility to support minerals processing research and testing.
- The facility bridges the lab and the production plant, working on process optimisation, flowsheet development and equipment testing and validation.
- Industry pilot campaigns and collaborative research programs are underway.



Collaborative Consortium for Coarse Particle Processing Research

- Better processing of coarse particles can bring a range of benefits, including higher plant throughput, lower energy use and improved water recovery.
- In 2020, SMI established the Collaborative Consortium for Coarse Particle Processing Research to create shared research outcomes for all industry participants.
- Phase 2 (2025–2030) is underway with more than eight industry sponsors.



Ore characterisation using advanced geological knowledge

- Flotation performance and comminution can vary significantly due to ore variability.
- At SMI high-quality analysis is underpinned by strong infrastructure, specialist expertise, and direct access to raw data.
- This analysis can help better reflect ore impurities or differences in energy input.



Learn more

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