Sustainable Minerals Institute

The University Of Queensland
AUSTRALIA
CREATE CHANGE

New Generation Modelling Collaborative Consortium

Shaping the next generation of mineral processing modelling

Mining companies are making increasingly complex and high-stakes decisions while processing more variable ores, integrating new technologies and pursuing greater sustainability.

Better models, better decisions, better outcomes

Existing modelling approaches were not designed for today's requirements and are being pushed beyond their limits.

The New Generation Modelling Consortium is a five-year industry-guided collaborative research program led by the Sustainable Minerals Institute's Julius Kruttschnitt Mineral Research Centre (JKMRC). The program is developing the next generation of liberation-based process models for mineral processing. Its goal is to reduce uncertainty in mineral processing decisions by building models that better represent the particle and process behaviours that drive performance.

Our purpose

Advance predictive modelling capability to improve decision quality, reduce technical risk and accelerate innovation across future mineral processing operations.

Build the predictive foundation that will power future digital decision-support and optimisation systems.

Why this matters now

Increasing uncertainty

Ores, technologies and circuits are changing rapidly, pushing traditional models beyond their capabilities and increasing uncertainty in design and operational decisions.

Costly and time consuming

Developing knowledge through large experimental programs is costly, time-consuming and difficult to scale across every technology and flowsheet option.

New capability, new opportunity

Advances in CFD, DEM, high-performance computing and AI now create the opportunity to build models that are better grounded in process physics and particle behaviour.

The value proposition

More confident decisions

Improve confidence in technology evaluation, circuit optimisation and expansion projects—resulting in better design and operational outcomes.

Lower cost and risk

Reduce expensive pilot campaigns, engineering uncertainty and technology adoption risk—leading to lower capital and operating costs.

Future-ready capability

Provide the modelling foundation for integrated circuit simulation, digital twins, soft sensors and model-informed process control.

Founding partners will shape the future

Founding partners help shape research priorities, guide program direction, gain early access to emerging modelling capability and accelerate industrial deployment.

The challenge

Why current modelling approaches are reaching their limits

Process models underpin major decisions across the mining lifecycle. Processing more variable ores, integrating new technologies and increasing demands for optimisation and process control are pushing traditional models beyond their capabilities.

Process models are essential

They support flowsheet design, feasibility studies, production forecasting, circuit optimisation, process control and strategic investment decisions.

Traditional model development is costly and time consuming

Many models rely on extensive physical testwork, empirical calibration and expert interpretation of observed performance trends.

Empirical models have limits

Models are most reliable within the conditions for which they were developed. Applying them to new ores, emerging technologies or integrated circuits increases uncertainty, often leading to conservative assumptions and missed opportunities.

Impact on decisions and outcomes

Higher testwork burden

Large experimental programs are required to generate and validate model relationships, increasing cost and time.

Greater design uncertainty

Conservative assumptions and safety factors are needed when applying models beyond tested conditions.

Slower technology adoption

Emerging technologies and integrated circuit designs are harder to evaluate confidently, slowing adoption and reducing the opportunity to realise value.

Experimental programs provide valuable insight but cannot practically explore every ore type, operating condition or technology option.

Traditional model development and workflow

1. **Extensive physical testwork**
2. **Interpretation of results**
3. **Empirical simulation models**

The limits: Useful within tested conditions, but uncertainty increases when extrapolated to new ores, integrated circuits or new technologies.

4. **Decision making**

The future of mineral processing requires a new generation of predictive, integratable process models that reduce uncertainty, improve decision quality and accelerate innovation.

The opportunity

Why now?

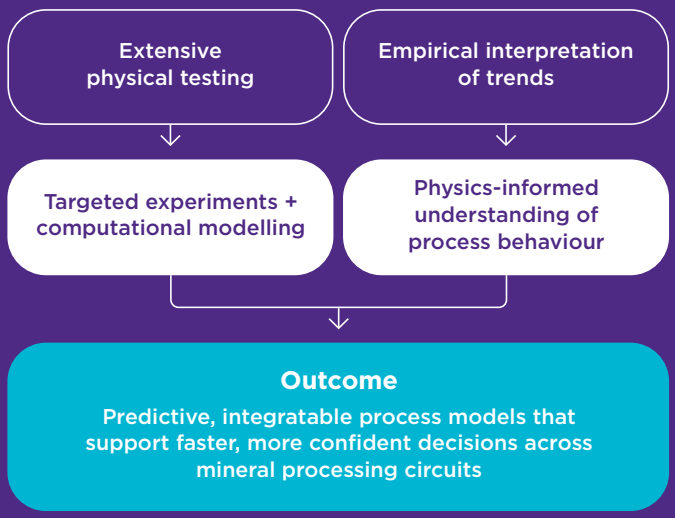
Advances in high-performance computing, CFD, DEM, AI-enabled workflows and advanced particle characterisation are unlocking a step change in process modelling.

Models can now be developed that are more closely grounded in process physics and particle behaviour, enabling faster and more confident engineering and operational decisions.

Toward predictive and integrated process models

The proposed approach uses targeted experiments to build and validate computational models, enabling simulation of operational and design scenarios and improved understanding of process fundamentals.

Model development is shifting



Enabling the future of mineral processing

Future processing circuits will combine conventional and emerging technologies. Models must capture the behaviour of particles, unit operations and entire circuits to enable more confident engineering and operational decisions.

- Assess particle properties and liberation
- Determine interactions between grinding and separation
- Predict performance of emerging technologies
- Simulate integrated circuit behaviour
- Evaluate alternative operating and design scenarios
- Enable digital twins, soft sensors and model-informed control

New generation models are a key enabler of future digital capability. This includes advanced simulation, digital twins, soft sensors and model-informed process control.

Research aim

Develop liberation-based process models that accurately predict the performance of existing and emerging mineral processing technologies.

Targeted experimentation, physics-informed simulation and advanced computation will be combined to generate virtual datasets and improve understanding of the particle and process behaviours that drive performance, accelerating model development.

Research focus areas

Grind to Separate

Develop process models for existing and emerging grinding technologies that predict mineralogical and liberation outcomes, rather than particle size alone.

Precision Classification

Develop process models for size and density-based classification as a function of particle attributes, enabling evaluation of strategies that improve separation outcomes.

High Intensity Flotation

Progressively develop models for conventional and high-intensity flotation technologies within a liberation-based framework to assess strategies for faster and more selective flotation.

Enabling Research

Develop the foundational methods, data structures and tools to support and connect the process models generated across the program.

The Consortium

Creating value through collaboration

The New Generation Modelling Consortium is a five-year, industry-guided collaborative research program led by the JKMRC at The University of Queensland.

By combining investment, data, expertise and shared technical priorities, we accelerate the development and deployment of next-generation modelling solutions that deliver measurable value across the minerals value chain.

Participation pathways

Full Consortium sponsorship

Access the full research program and help shape research priorities and program direction.

Existing research contribution

Contribute existing research activities that complement and add value to the Consortium program.

Equipment supplier participation

Collaborate to integrate technology, data and insights into future modelling capability.

Targeted project sponsorship

Contribute to specific research activities or themes aligned with organisational priorities.

Why collaborate?

Shared investment

Pool resources to tackle complex challenges at scale and reduce individual cost.

Shared data and expertise

Leverage collective data, experience and technical know-how to achieve more together.

Shared outcomes

Co-develop practical tools and insights that deliver broad, long-term industry benefit.

Why JKMRC?

JKMRC is a world-leading centre for minerals modelling and simulation research, with strong industry partnerships and a proven track record of translating research into operational impact.

- Advanced mineral processing and process modelling expertise
- Extensive industrial datasets from plant surveys and testwork
- Proven CFD and DEM simulation and data analytics capability
- Access to advanced particle characterisation and liberation methods
- Established pathways for translating research into software tools and industry capability
- Experience leading successful collaborative industry research programs

What partners gain

- Shape research priorities
- Access emerging capability
- Reduce technology adoption risk
- Build future-ready capability
- Shared investment and expertise

Let's build the future together

Interested companies are invited to discuss potential participation and priority research areas.

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