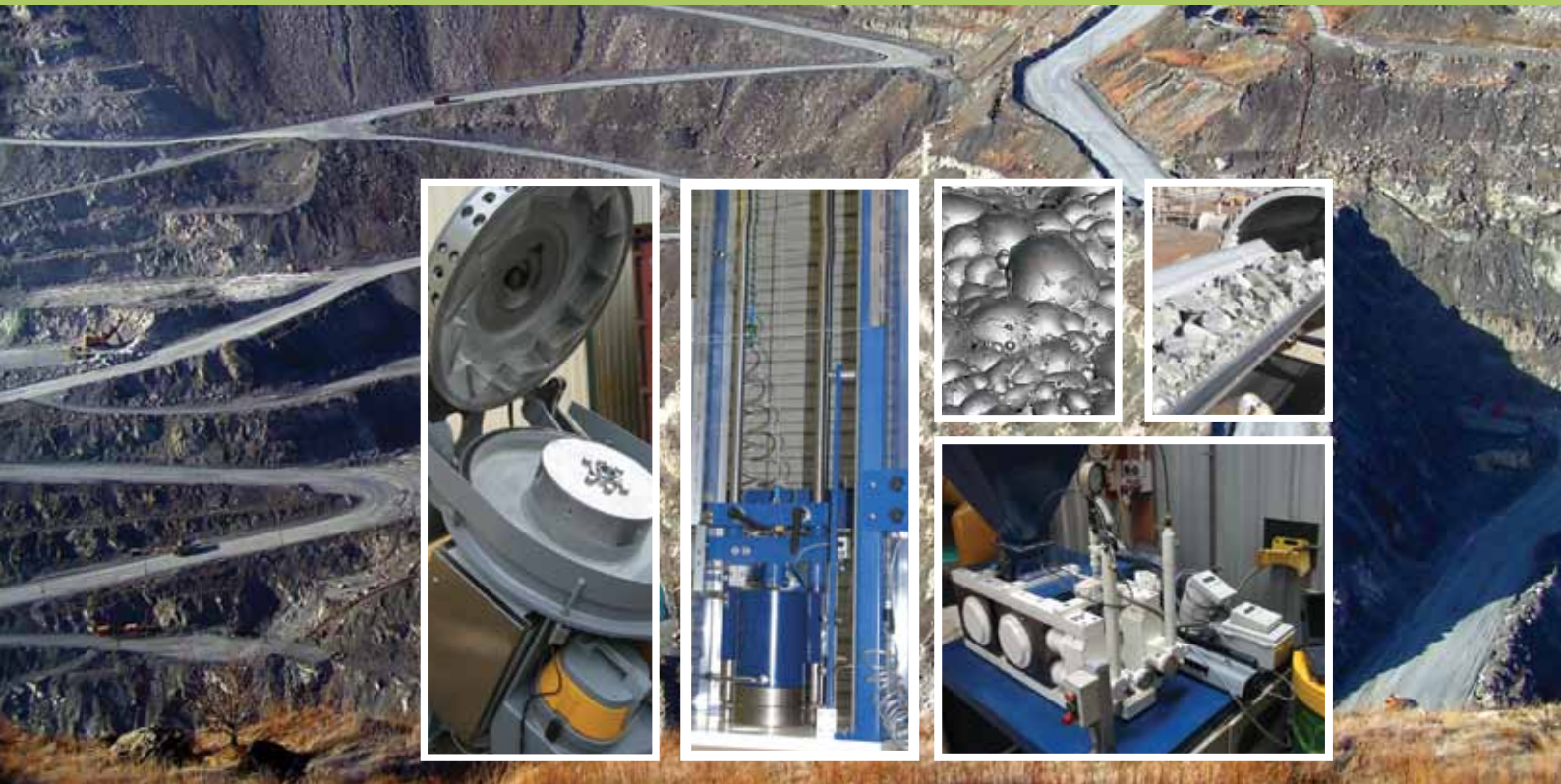


JKTech Laboratory Services

Delivering innovations to the global resources industry through testing and measuring ore characteristics and plant performance parameters.



JKTech Pty Ltd
www.jktech.com.au

The JKTech Laboratory Services group specialises in providing services which compliment our consulting services in comminution, flotation and geometallurgy projects, measuring rock properties and plant performance parameters. A broad range of laboratory and medium scale equipment is available and many types of tests can be conducted by our experienced staff.

COMMINUTION TESTING

Comminution Testing, involves testing the breakage characteristics of a sample of rock, to determine the energy needed to crush a particular rock to a particular size. There are a number of tests offered at JKTech in the area of comminution.

JK Rotary Breakage Test

The JK Rotary Breakage Test offers industry a rapid method for determining accurate and reliable impact breakage characterisation data for plant design and optimisation. The breakage parameters are used in the JKSimMet Mineral Processing Simulator software to analyse and/or predict AG/SAG mill performance.

JK Drop Weight Test

The JK Drop Weight Test is the industry standard for characterising ore under AG/SAG milling or crushing conditions. The test provides ore specific parameters which are used in the JKSimMet Mineral Processing Simulator software to analyse and/or predict AG/SAG mill performance, and ore type characterisation for the JKSimMet Crusher model.

SMC Test®

The SMC Test® provides a cost-effective means of profiling an ore body to predict its comminution circuit throughput, rock mass characteristics and blasting properties. The test can be used in greenfield, brownfield and established operations, and determines the Drop Weight Index of a sample.

Bond Rod Mill Index Test (BRMWI)

A BRMWI Test is a standard test for determining the Rod Mill Work Index of a sample of ore. The BRMWI is a measure of the resistance of the material to crushing and grinding. It can be used to determine the grinding power required for a given throughput of material under rod mill grinding conditions.

Bond Ball Mill Index Test (BBMWI)

A BBMWI Test is a standard test for determining the Ball Mill Work Index of a sample of ore. The BBMWI is a measure of the resistance of the material to crushing and grinding. It can be used to determine the grinding power required for a given throughput of material under ball mill grinding conditions.

Isa Mill Test

The IsaMill is a horizontal high intensity stirred mill. The IsaMill Test generates data which can be used to determine the effectiveness of IsaMill in a particular application and to enable process design.

High Pressure Grinding Rolls (HPGR) Test

High Pressure Grinding Rolls (HPGR) are increasingly becoming a part of hard rock processing due to their energy efficiency, ability to induce micro-cracks and preferential liberation, coupled with high throughput and high reduction ratio.



FLOTATION TESTING

JKTech can perform batch flotation testing to customer specified test conditions. Outcomes from such a test include: determination of parameters for flotation modelling; optimisation of flotation conditions; ranking evaluation of flotation responses of different parts of orebody; assisting in process selection for greenfield projects, and evaluation of flotation chemicals.

A wide range of reporting requirements can be specified by the customer, from delivery of raw results for the client to interpret to full analysis and interpretation by JKTech consultants.

JK Floatability Index (JKFI) Test

The JKFI makes use of the latest laboratory batch flotation test technology, performing tests and varying bubble surface area flux to derive a floatability index and produce a number of key model parameters from rock samples. The index and parameters are used to predict plant metallurgical performance of flotation circuits before there is a change in plant feed. JKSimFloat, in conjunction with the JKFI Test, provides a very powerful tool for minimising the risk of falling concentrate grades or increased losses of valuable metals to tails.

Locked Cycle Test

The Locked Cycle test is undertaken at a laboratory scale in order to simulate a continuous flotation operation. JKTech has adopted the Locked Cycle test with success and has used the methodology to validate JKSimFloat simulations under laboratory conditions.

Reagent Evaluation Test

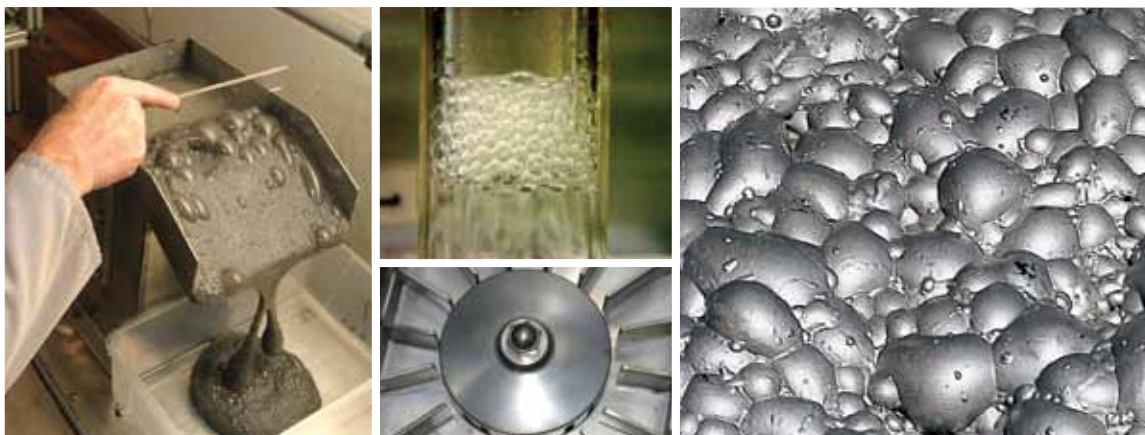
The Reagent Evaluation test is a laboratory-scale batch test, undertaken to assist the plant operations with reagent optimisation. These tests can also be used to evaluate flotation process performance using new reagents for an existing or new orebody. Its major advantage is to identify the appropriate reagent and consumption rate for an orebody with lesser amount of cost and time.

Process Evaluation Test

The Process Evaluation test is a laboratory-scale batch test, which can evaluate the individual plant operation cell or bank (Roughers, Scavenger and Cleaners) performance by conducting the quick batch flotation tests. Results can be used to optimise the flotation performance for that individual cell or bank. These tests can also estimate the recycled process water performance in the plant.

Frother Characterisation

JKTech has developed a selection of laboratory equipment and techniques, specifically relating to bubble size and frother analysis, with equipment calibrated under standard conditions to ensure high reproducibility. Frother characterisation is an increasing consideration in froth flotation and also in terms of residual frother in plant water and its effects on other plant areas. JKTech utilises a number of methods to characterise frothability and bubble coalescence, including the Lederer Procedure, the Padgett Method and the Bubble Size Analyser.



CLASSIFICATION AND OTHER SERVICES

Hydrocyclone Test

Hydrocyclone Tests can be carried out by JKTech for cyclone characterisation, for benchmarking or to produce JKSimMet model parameters for mineral processing circuit simulation.

Sizing Measurement Tests

Sizing analyses provide useful information on the size distribution of a sample of ore or other material. They may be required for many reasons, including: to understand how a mill or other unit operation is working; to work out physical or chemical properties of the sample; in design of new equipment or optimisation of an existing facility. JKTech can provide assistance with sample collection, preparation of representative subsamples and analysis of results.

Microanalysis

X-ray Diffraction (XRD)

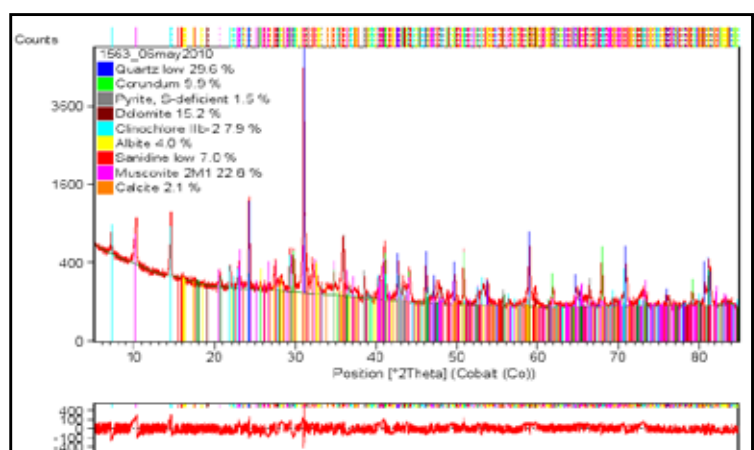
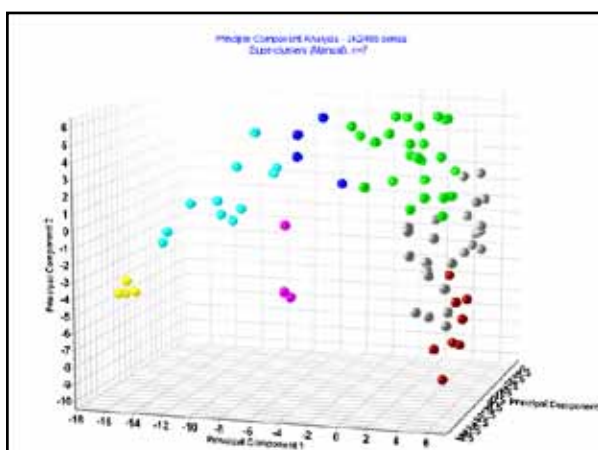
XRD uses the unique x-ray fingerprint of each mineral to identify and quantify its presence in a powdered sample of rock, ore, plant feed, concentrate or tailing sample. The JKTech XRD Facility is centred on a PANalytical X'PERT MPD PRO instrument equipped with PANalytical's HighScore Plus advanced acquisition and data processing software. The facility offers three modes of analysis:

- Qualitative Identification - mineral present
- Semi-Quantitative analysis - identification and estimation of major/minor/trace components
- Quantification of mineral species present - Rietveld quantification

Electron Probe Microanalysis (EPMA)

Electron microprobe analysis offers a range of microchemical analysis capabilities for mineral characterisation. Accurate and precise chemical quantification of major and minor elements to better than 0.03wt% is routine using spot analysis mode down to 1um in size. The JKTech EPMA Facility uses a 4-spectrometer CAMECA SX50 microprobe supported by SAMx data acquisition and processing software suite. Mineral characterisation applications of EPMA data include:

- Accurate major and minor element numerical modelling
- Deleterious element location and quantification
- Minor to trace level element distribution and quantification
- Element distribution mapping



BENEFITS OF WORKING WITH JKTECH

1. Access to cutting edge research and technology from the Centres of the Sustainable Minerals Institute (SMI).
2. A dedicated team of world class specialists, experts in their field, working to maximise the potential of each stage in your project lifecycle.
3. Innovative and proven techniques developed by leading industry experts.
4. Measurable increases in productivity and metal recovery, resulting in a more sustainable and profitable operation.
5. A global network of agents delivering JKTech products and services.

About The Company

JKTech Pty Ltd is the technology transfer company for the Sustainable Minerals Institute (SMI) at The University of Queensland. Its role is to take viable research outcomes and transfer them to the international minerals industry.

JKTech offers a range of innovative solutions for the minerals industry aimed at optimising sustainability, increasing productivity and metal recovery and reducing operating costs. These specialist products and services include consulting, software, equipment, laboratory services and knowledge transfer.



SMI JKMRC

Julius Kruttschnitt Mineral
Research Centre

SMI BRC

WH Bryan Mining &
Geology Research Centre

SMI CMLR

Centre for Mined Land
Rehabilitation

SMI MISHC

Minerals Industry Safety
& Health Centre

SMI CSRM

Centre for Social
Responsibility in Mining

SMI CWiMI

Centre for Water in the
Minerals Industry

FURTHER INFORMATION ON LABORATORY SERVICES

The JKTech Laboratory Services group utilises experienced staff and a wide range of equipment for measuring rock properties and plant performance parameters.

For more detailed information on JKTech's entire range of laboratory services, please visit the JKTech website, www.jktech.com.au, or contact our Laboratory Services Manager.

Laboratory Services Manager

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JKTech Services

JKTech's extended range of technologies and products, all supported by the ongoing research activities of the Sustainable Minerals Institute at The University of Queensland, include:

- Consulting (comminution, flotation, mineralogy, mining and geometallurgy, mine-to-mill)
- Process mineralogy and in-house instrument analysis
- Specialist Software (JKSimMet, JKSimFloat, JKMultiBal, JKSimBlast)
- Specialist Equipment (JKRBT[®], JK Drop Weight Tester, flotation characterisation equipment)
- Metallurgical Laboratory Services
- SMI Knowledge Transfer (professional development, training courses, workshops)

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