Metallurgical Services

CPG Resources – Mineral Technologies

Leaders in Mineral Separation

CPG

Expertise. Experience. Superior Technology.

Mineral Technologies is a global leader in mineral separation and mineral processing solutions. We deliver a comprehensive range of equipment and services that cost effectively transform ore bodies into highgrade mineral products.

A key part of our service delivery is our Metallurgical Services Division which specializes in:

- Minerals testing
- Mineral characterisation
- Sample evaluation
- Process design and flowsheet development
- Equipment commissioning and training
- Process optimization, audits and sampling surveys

Minerals Testing

Our world class test facility delivers extensive testwork capabilities including:

- Mineral characterization and separation testwork
- Bench and pilot scale testing
- Density fractionation by heavy liquid separation and pycnometry
- Metallurgical data evaluation
- Production of bulk mineral concentrates

Our test facility, operated by industry experts, is highly regarded for providing accurate and reliable results which are used to develop cost-effective process flowsheet designs for new and existing mineral processing circuits.

As a certified quarantine station, our test facility has the capacity to work with samples of any size, and we can quantify mineral characteristics and processing options for a wide range of minerals including: mineral sands, coal, iron ore, chrome, tin, silica sands, bauxite, tantalite, scheelite, base and precious metal ores, gems and industrial minerals.

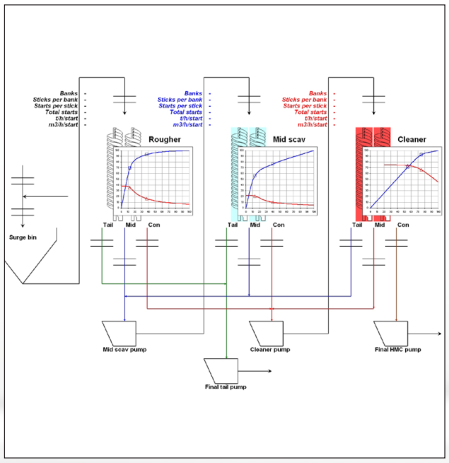
Our process metallurgists are experienced in the complete range of analytical, bench, pilot and industrial-scale testing using wet and dry processing techniques.

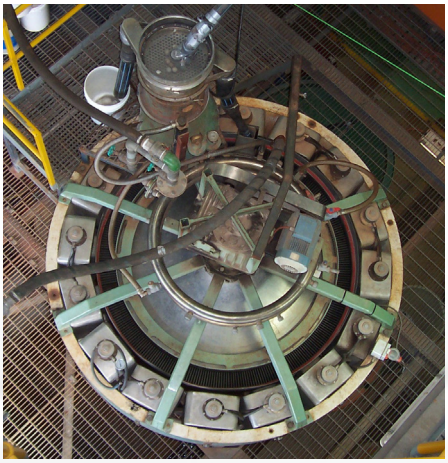
Mineral Characterisation

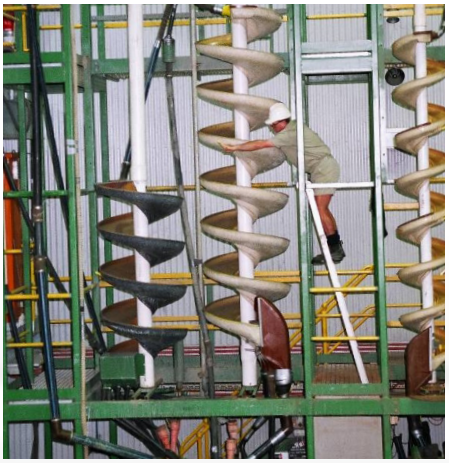
Many of our test programs begin with mineral characterisation which can involve:

- Density Fractionation by Heavy Liquid Separation (HLS) and Water Pycnometry (IPP)
- Size analysis by dry/wet screening, desliming, cyclosizing and laser sizing
- Magnetic Fractionation using various types of magnetic separation including induced roll magnetic separators (IRM) and Rare Earth (RE) magnetic separators
- Microscopic evaluation using grain counting and UV light
- Electrostatic separation using new generation High Tension (HT) Roll (Carrara) and Electrostatic (ES) Plate separators by XRF and ICP
- Mineralogy including QEMSCAN, MLA and XRD

These procedures may also be used in the processing of large numbers of drilling samples.







Process Design & Flowsheet Development

Our process metallurgists are experienced in developing wet concentration plant (WCP) and mineral separation plant (MSP) flowsheets.

WCP flowsheets generally consist of multistage spiral circuits incorporating different spiral models. Low grade mineral sand ores with heavy mineral (HM) content around 1% may be upgraded to over 95% HM in a typical flowsheet design with recoveries of over 95% achieved.

The spiral models available for flowsheet development include Medium Grade (MG series), High Capacity (HC series), High Grade (HG and VHG Series), Washwater (WW Series), Coal Spirals (LD series) and Fine mineral (Fm series).

The concentrate produced from the WCP test work may then be separated into its various components (e.g. rutile, zircon, ilmenite as well as many other mineral types) in the MSP which consists of wet and dry separation stages. Highly selective wet gravity separation is required in the MSP and may incorporate shaking tables, classifiers and Kelsey Centrifugal jigs as well as spirals.

The dry separation stages may involve new generation Carrara High Tension separators and dry magnetic separation utilising Induced Roll or RE (rare earth) magnetic separators.

Samples from 100kg to several tonnes may be required for the flowsheet development programs. Validation programs involving bulk processing of up to several hundred tonnes may also be undertaken.

Well structured test programs are carried out to develop the most cost effective and efficient flowsheet designs using the latest technology to meet project specifications.

The WCP and MSP processes utilised above are typically used for mineral sands however may be used for many other mineral types including;

- Glass (Silica) sands
- Crushed hard rock ores (Fe, Cr, Ti, Sn, W)
- Gold & Platinum
- Coal
- Industrial minerals
- Alumina

Modeling Software

Supporting our testing process is a suite of modeling software developed exclusively by Mineral Technologies. One of the significant advantages of our modeling software is its ability to predict the effect of stage recirculating streams which cannot be fully tested in a laboratory environment. This capability provides additional confidence in predicting mineral processing outcomes.

Sample Evaluation

Our spiral test rigs are equipped with automatic timed simultaneous samplers to ensure accurate sampling. The rigs are designed to enable simultaneous testing of two spiral separator models to facilitate highly accurate performance comparison. The test samples are prepared and analysed for a variety of analytes including:

- HM (Heavy mineral >2.85SG)
- VHM (very heavy mineral >4.05SG)
- Chemical assay by XRF/ICP/Fire Assay
- Magnetics and Non-magnetics
- Optical/electron microscopy methods
- Photomicrographs and photography
- Size analyses using sieves, Warman Cyclosizer, Malvern Laser Sizer

Our laboratory is equipped with an extensive heavy liquid separating facility capable of processing small and large numbers of samples. SG separations up to 4.05SG can be carried out by adjusting the SG of the various heavy liquids used. Water pycnometry is also available for determining the SG of coarser particles.

Sample Size & Preparation

Our test facility can process samples from a few kilograms up to several hundred tonnes.

Minimum sample masses are required to operate some of our equipment. Multiple stage programmes require larger samples but the masses shown below provide a typical minimum quantity (of prepared samples) for single stage testwork.

- Spiral separator (except HC1 and HC1RS model) 50kg
- Spiral separator (HC1 and HC1RS model) 100kg
- Magnetic Separators (Lab-scale IRMS & Lift) 0.5kg
- Magnetic Separators (RE Drum) 10kg
- Magnetic Separators (RE Roll) 5kg
- Magnetic Separators (WHIMS) 10kg
- Electrostatic Separators (laboratory scale) 2kg
- Electrostatic Separators (production scale) 200kg
- Up-current classifier 50kg
- Wet Shaking Table (Wilfley laboratory scale) 5kg
- Wet Shaking Table (Holman 2000 – quarter size) 100kg
- Kelsey Jig J200 50kg

Equipment Commissioning & Training

Our experienced product and process engineers are skilled at achieving optimum performance from process equipment and operating systems, and delivering on-site training in mineral processing operations worldwide.

The commissioning process includes thorough testing of all equipment and processes to ensure mineral products achieve the target specified in the design process.

Our core capabilities include:

- Equipment and process commissioning
- Performance testing
- On-site training for operations, engineering and maintenance teams

Process Optimisation, Audit & Sampling Surveys

Our process optimisation services ensure that mineral processing operations achieve optimal results. By following our proven audit methodology that goes beyond the average ‘check list’ approach, our experienced metallurgists and process engineers identify bottlenecks and use detailed process flow analysis to develop circuit modifications that deliver grade and recovery improvements.

Our practical ‘hands-on’ support ensures onsite operation teams participate fully, and are then trained to successfully implement and maintain the modified process to deliver improved results. Our core capabilities include:

- Plant auditing
- Evaluation of internal and external testwork
- Development of workable solutions for process optimisation
- On site operator training

Processing Equipment

Our Metallurgical Services team use an extensive range of mineral separation equipment. Most of the separating equipment is available in either industrial or bench scale. The performance of the bench scale equipment is readily scalable as the separating zones within these machines are the same as in the industrial equipment. The separation equipment is updated as required and incorporates the latest innovations from our Research and Development Division.

Feed Preparation Equipment

- Feeding Systems (apron feeders, table feeders, vibrating feeders, bucket elevators)
- Scrubber / Trommel
- Screening (Kason, flat inclined, sieve bend)
- Screw Classifiers
- Upstream Classifiers / Hydrosizers
- Hydrocyclones (50 to 200mm diameter),
- Dewatering cones
- Pumps and sumps
- Dryers (Rotary, low temperature air cupboards and gas stoves)
- Purpose built test rigs with instrumentation
- Sample Splitters (Carousel, Riffle)

Gravity Separation Equipment

- Spirals (MG series, HG series, VHG series, HC series, WW series and FM series)
- Tray Rig for Cone Concentrator simulation
- Wet Shaking Tables (Holman 2000, Wilfley laboratory scale)
- Air Table (laboratory scale)
- Kelsey Centrifugal Jig (J200 High efficiency gravity separator)
- Gemini Table and Knudson Bowl (Gold)
- Upstream Classifiers (Various sizes including TBS)
- Baum Jig (Similar to a conventional Jig except it uses an air actuated pulse instead of mechanical; used for coarser mineral e.g. Fe)

Wet Magnetic Separators

- WHIMS (wet high intensity magnetic separator with wide or narrow rotor)
- LIMS (Low intensity magnetic separator for separating minerals such as magnetite)
- MIMS (Medium intensity magnetic separator similar to LIMS except with higher field strength using RE magnets in place of ferrite magnets)

Dry Magnetic Separators

- IRMS (Induced Roll Magnetic Separator)
- Lift IRM (used mainly for analytical testwork)
- REDMS (Rare Earth Drum magnetic separator)
- RERMS (Rare Earth Roll magnetic separator)
- Dry LIMS (Low Intensity Magnetic Separator)

Electrostatic Separating Equipment

- Carrara HTR (new generation high tension roll separator)
- ES Plate (Electrostatic Plate Separator)
- ES Screen Plate
- Tribostatic Separator

Grinding and Crushing

Crushing and grinding facilities are available such as Jaw crusher, Roll crusher, Lab rod / ball mills, disk pulveriser and KAD mill for fine grinding.

CPG Resources – Mineral Technologies

Locations

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