



Minerals Testing

Our world class test facilities deliver extensive testwork capabilities including:

- mineral characterisation and separation testwork;
- bench and pilot scale testing;
- density fractionation by heavy liquid separation and pycnometry;
- metallurgical data evaluation; and
- production of bulk mineral concentrates.

Whether performed in our extensive metallurgical test laboratory in Australia, or in the USA, South Africa, Brasil or India, our testing is operated by industry experts. Our process metallurgists are experienced in the complete range of analytical, bench, pilot and industrial scale testing using wet and dry processing techniques.

We are 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 Australian test facility has the capacity to work with samples of any size. At this facility 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.

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 roll (HTR) and electrostatic plate (ES) separators; and
- mineralogy including QEMSCAN, MLA and XRD.

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

Process Design and 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 a range of 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 VH series); washwater (WW series); coal spirals (LD series); and fine mineral (FM series).

The concentrate produced from the WCP testwork may be separated into 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.



Metallurgical Services

The dry separation stages may involve new generation Carrara High Tension Roll (HTR) separators and dry magnetic separation utilising Induced Roll Magnetic (IRM) or Rare Earth (RE) magnetic separators.

Samples from 100 kilograms (kg) 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 and platinum;
- coal;
- industrial minerals; and
- alumina.

Modelling Software

Supporting our testing process is our in-house designed suite of modelling software. This provides us with the significant advantage of predicting 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; and
- 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 and 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 programs require larger samples however 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 (laboratory scale IRMS and 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; and
- Kelsey Jig J200 50kg.

Equipment Commissioning and 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; and
- on-site training for operations, engineering and maintenance teams.

