

JKTech Laboratory Services

JK Drop Weight Test



Developed in the laboratory at the JK Centre in 1992, the JK Drop Weight Test measures impact breakage parameter to maximise ore characterisation and increase productivity.

The JK Drop Weight Test

The JK Drop Weight Test is now an industry standard for use in characterising ore under AG/SAG milling conditions and is available at the JK Centre, various commercial laboratories, and at in-house company laboratories around the world.

The JK Drop Weight Test provides ore specific parameters which are used in the JKSimMet Mineral Processing Simulator software to analyse and/or predict AG/SAG mill performance. The same test procedure also provides ore type characterisation for the JKSimMet crusher model.

In an AG/SAG mill, there are two main mechanisms of breakage: impact (high energy) and abrasion (low energy).

The abrasion breakage parameter, t_a , is determined by a tumbling test. The impact breakage parameters, A and b, are determined using a high energy impact breakage device called the JK Drop Weight Tester.

Quality Control

JKTech recognises the responsibility of ensuring test standards are maintained and as a result:

- JKTech conducts frequent in-house checks of the JK Drop Weight Test procedure and equipment, and
- JKTech organises regular comparative calibration tests with all of its commercial and private JK Drop Weight Test licensees

These tests confirm the validity of the standard procedure as well as giving a measure of the relative accuracy of the results.

Benefits

The JK Drop Weight Test generates data which can be used for process design of SAG Mills and Crushers for 'Green Field' projects. Drop Weight Tests conducted on ore obtained from plant surveys can be used to optimise circuits and plant productivity increases.



The JK Drop Weight Tester

The JK Drop Weight Tester comprises a steel drop weight (pictured above) which is raised by a winch to a known height. A pneumatic switch releases the drop weight which falls under gravity and impacts the rock particle which is placed on a steel anvil.

The device is enclosed in Perspex and incorporates a variety of features to ensure operator safety. By varying the height from which the drop weight is released and the mass of the drop weight, a very wide range of energy inputs can be generated.



Impact Breakage Testing Procedure

After release of the drop weight it descends under the influence of gravity and impacts the target particle. The particle is subsequently broken and at the same time the drop-weight is brought to rest at a distance above the anvil approximately equal to the largest product particle.

The difference in distance between the initial starting point and the final resting place of the drop-weight is used to calculate the energy that is expended in breaking the particle

To test an ore type, the original 100 kg sample is sized into selected size fractions. Ten to thirty particles are required in each size fraction for each energy level, depending on particle mass. Typically fifteen size/energy combinations are selected. The input energy levels for a particular test are designed to suit ore hardness.

The breakage products of all particles for each size/energy combination are collected and sized. The size distribution produced is normalized with respect to original particle size.

For a wide range of specific energy input (E_{CS}), particle sizes and ore types, the relative size distributions remain similar in shape and can be described by a single point on the distribution. The JKTech convention is to use the percentage passing one-tenth of the original particle size. This is referred to as the " t_{10} ".

In the manner described above, a set of t_{10} and E_{CS} values is produced for the 15 energy/size combinations.

Sample Requirements

The minimum quantity of sample required to provide sufficient particles for testing is 100 kg of crushed rock in the -75+12.5 mm size range, or 120 kg of drill core.

JKTech can prepare a sample to the specified size range from a larger amount if required.

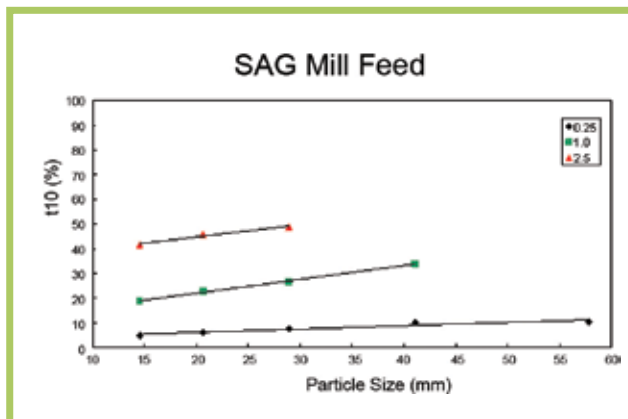
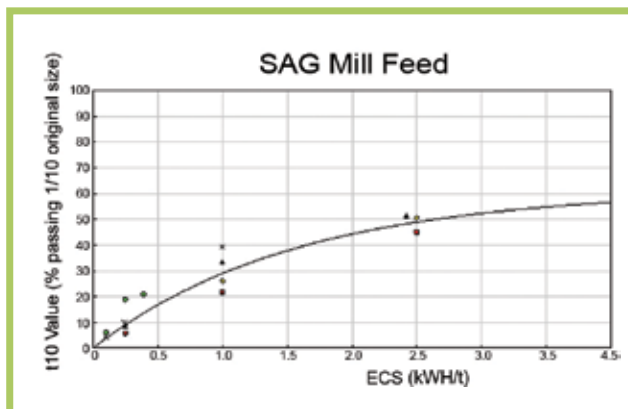
For diamond drill core samples, the core must be un-split and have a diameter of at least 50 mm. Slightly more material is preferred if Bond Work Index testing is also required.

Abrasion Breakage Testing Procedure

It is possible to characterize low energy (abrasion) breakage with the abrasion test.

The standard abrasion test tumbles 3 kg sample in a standard abrasion test mill.

The resulting product is then sized and the t_{10} value for the product is determined.



JKTech Services

- Consulting (comminution, flotation, mineralogy, mining & geometallurgy)
- Process Mineralogy and In-House Instrument Analysis
- Specialist Software (JKSimMet, JKSimFloat, JKMultiBal, JKSimBlast)
- Specialist Equipment (ore breakage characterisation, flotation characterisation)
- Metallurgical Laboratory Services
- SMI Knowledge Transfer

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