



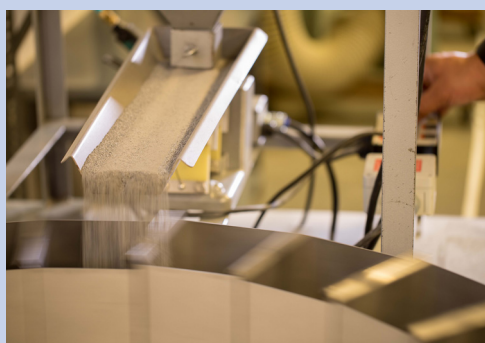
Product datasheet

WEMCO® Attrition testing programs

Efficient attrition scrubbing removes unwanted contaminants, impurities, surface films, coatings, clays or slimes to improve mineral values and create a more desired product, without damaging or degrading the recovered particles.

Lab-scale attrition testing evaluates the effectiveness of your process and determines your retention time requirements and optimum feed percent solids.

This helps to ensure proper equipment selection for the most efficient operating configuration, including the appropriate cell size and quantity required for your operation.



Attrition testing

Test	Unit cost	Sample weight requirements
Sample preparation	Varies based on top size, sample mass and screening requirements	
<ul style="list-style-type: none"> ▪ Stage crushing 		
<ul style="list-style-type: none"> ▪ Blending 		
<ul style="list-style-type: none"> ▪ Rotary splitting 		
<ul style="list-style-type: none"> ▪ Grinding 		
<ul style="list-style-type: none"> ▪ Screening into specific size fractions 		
As-received particle size distribution (PSD)	\$150	0.5 kg
Attrition testing	\$600/test	1 kg/test
<ul style="list-style-type: none"> ▪ Percent solids variation 		
<ul style="list-style-type: none"> ▪ Retention time variation 		
<ul style="list-style-type: none"> ▪ Product PSD 		
Assay analyses	Varies based on requested elements	
Mineralogical characterisation – XRD	Varies based on process objectives	
Bulk density	\$50	
Specific gravity	\$50	
Turbidity	\$50	
Acid solubility	\$18	
Loss on ignition (LOI)	\$10	
pH	\$10	
Durability testing*		

*While tests are performed to ASTM standards, please note the FLSmidth Minerals Testing Centre is not a certified laboratory.

Attrition testing

Our Attrition testing programs incorporate all of the testing parameters required to determine feed and product characteristics, optimum percent solids and required retention time, all of which assist in equipment selection and process configuration.

Attrition testing performed at our Minerals Testing and Research Centre utilises a WEMCO® attrition testing machine. An octagonal stainless-steel attrition cell mimics full-scale equipment and expected hydrodynamic patterns. The testing scale agitator also mimics the full-scale WEMCO Attrition Scrubber design, comprising three stacks of opposing-pitched blades.



Sand scrubber testing offerings:

- **Retention time testing** – In this test, sand samples are scrubbed at different retention times to optimise the necessary time required to attain a desired scrubbed product.
- **Percent solids testing** – By scrubbing sand samples at different pulp densities, this test will optimise the necessary percent solids required to attain a desired scrubbed product. The testing also helps to determine the required number of attrition cells in the full-scale design, in order to meet flow rate requirements.
- **Particle size distribution (PSD) analysis** – Samples are screened at selected size fractions on as-received feed and attrition products in order to determine the attrition efficiency per size fraction. Some flowsheets require only a sized fraction of the feed to be attritioned. We generate the sized fraction using sieve screens that simulate the screened or cyclone product expected in the plant, which can then be used for attrition scrubber testing, as well.

We have the capability to combine upstream and downstream process parameters into the testing campaign to evaluate crushing or grinding, pre-attrition physical size separation, other physical or chemical separations and tailings management.

Cyclone simulation

Cyclone simulation from our experts at uses computational modelling to help predict the PSD that can be expected from upstream cyclone dewatering. Pilot-scale simulation is also available upon request.

We also have the ability to test or simulate spiral separators, reflux classifiers and hydrosizers, where other size or density classification has been implemented.

Flotation

Flotation tests can be performed in conjunction with attrition testing to quantify the performance enhancement achieved via upstream utilisation of attrition cells. For many materials, such as phosphate, unwanted gangue slimes will adhere to the desired product, which can inhibit the separation efficiency within flotation circuits. Desliming in an attrition cell will instantly upgrade flotation efficiency.

Thickening and filtration

The desliming process can result in increased solids loads to downstream water recovery and tailings handling systems. Our testing programs evaluate the effects of enhanced slimes removal on downstream dewatering equipment. We also can provide the design basis for new dewatering equipment – including thickeners, centrifuges, vacuum filters and pressure filters.

Basic analytical

Our analytical laboratory supports testing programs by completing timely, accurate chemical analyses. Instrumentation and capabilities include elemental analysis by ICP-OES, ICP-MS, Leco combustion furnace, flame atomic absorption spectroscopy (AA), fire assay and various wet chemistry methods.

Basic mineralogy

Basic mineralogy analyses are necessary in order to determine samples' mineralogical composition. The sample mineralogy is useful in explaining how the ore variability affects the processing results, and it provides guidance on how to better process troublesome ores.

Advanced automated mineral analysis is also available, utilising QEMSCAN and TIMA instruments. Analysis is performed to evaluate bulk modal mineralogy, liberation/locking and metal department. Mass balanced mineralogy from process streams is helpful to determine process bottlenecks and optimise the circuit.

Basic mineralogy consists of several tests:

- Bulk mineralogy is accomplished by X-Ray Diffraction (XRD). This results in the bulk mineralogy of the sample, such as the percentage of quartz, feldspars, micas, clay, pyrite, etc.
- Clay analysis is accomplished by Cation-Exchange Capacity (CEC), which quantifies the swelling clay content in the sample.
- Ore texture analysis is accomplished with Optical Microscopy. It results in an understanding of the ore's particle size, along with a qualitative assessment of any liberation or shape issues.

Sample receipt

Our receiving policy is in accordance with U.S. law. In order for any sample to be received, we require that you provide an SDS prior to or at the time of sample arrival. Samples without an SDS may be rejected. Samples should be shipped to the Minerals Testing & Research Centre at 7068 S FLSmidth Drive, Midvale, Utah, 84047, USA. Your technical point-of-contact will provide all required shipping information.

Testing program

A purchase order is due prior to commencing the test program and should be sent directly to your technical point-of-contact. By issuing a purchase order to FLSmidth for the supply of laboratory services, you certify and represent that any material or samples supplied by you did not originate in a country against which the US or the EU has issued sanctions.

Sample disposal

After completion of the project report, we provide three months of sample storage. After this time, the remaining sample will be shipped back to you at your cost, or we may dispose of it in a safe and suitable manner at your cost. We firmly support cradle-to-grave responsibility. If disposal is required, a Toxicity Characteristic Leaching Procedure (TCLP) will be performed on the sample to determine if it is hazardous. If the sample is proven to be hazardous, a Proof of Destruction certificate will be provided to you.



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