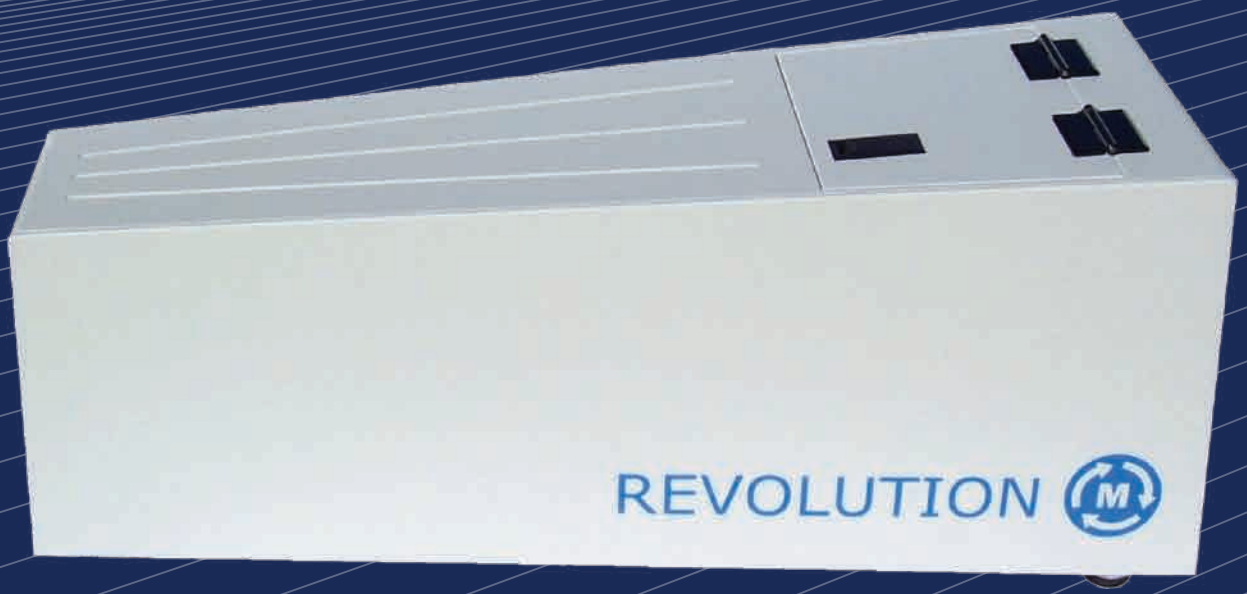
Revolution Powder Analyzer



Powder Testing for:

Flowability
Fluidization
Granulation & Caking

mercury scientific inc

Revolution Powder Analyzer

Powders change their state depending on their handling and storage.

Consolidated State
When compressed, powders behave more like solids and can even become solids under large loads.

Unconsolidated State
Between consolidated and fluidized states, powders can exhibit both solid-like and liquid-like properties.

Fluidized State
When moving or exposed to vibration, powders can fluidize and behave like a liquid.

Predicting a powder's behavior requires an understanding of the state of the powder in the process and how the powder transitions from one state to another. The Revolution Powder Analyzer measures powder properties and how they change from the consolidated state to the fluidized state. Flowability, Granulation & Caking, and Fluidization Tests measure the powder in different powder states.

Flowability

Unconsolidated State – Powder's ability to flow in low stress situations.
Consolidated to Unconsolidated States – Powder's ability to flow evenly from hoppers, containers and packages and changes in flowability during processing or storage operations.

Granulation & Caking

Unconsolidated to Consolidated States – Powder's ability to granulate with extended motion and the durability of the granules.
Unconsolidated to Consolidated States – Powder's ability to cake during storage and unconsolidate after storage.

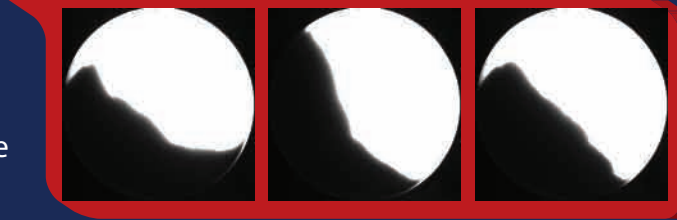
Fluidization

Unconsolidated to Fluidized States – Rate, time and rotation required for fluidization.
Fluidized to Unconsolidated States – Settling rate of the powder after fluidization.

How does the REVOLUTION work?

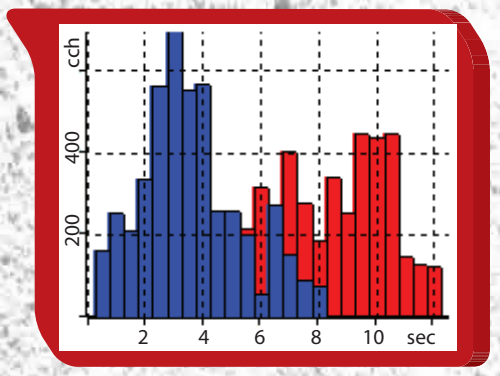
Test powder is placed in the sample drum that has two borosilicate glass sides. A motor turns two high precision silicone rollers, which in turn rotate the drum. A digital camera with the assistance of cold cathode backlight illumination takes images of the powder during the rotation process.

The digital camera captures images of the powder in the rotating drum at the specified speed. The three images displayed at right represent an avalanche cycle from rest position to peak power to completed avalanche.



Building **Peak** **Change**

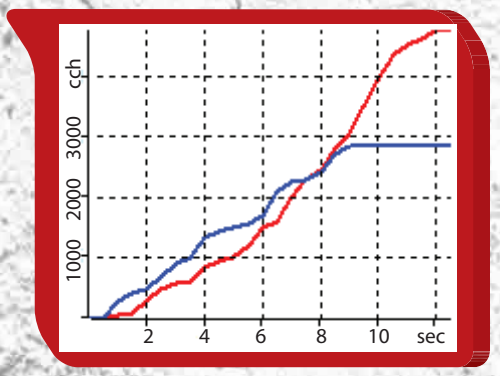
In every image collected, the software measures many aspects of the powder, including the potential energy, angle, surface fractal and volume. The Revolution Powder Analyzer calculates the avalanche power by measuring the change in potential energy before and after each avalanche. A free flowing powder will avalanche almost continuously, never building a significant peak. A powder that flows less freely will exhibit avalanches with higher power values.



Power Spectrum - Flowability

FLOWABILITY

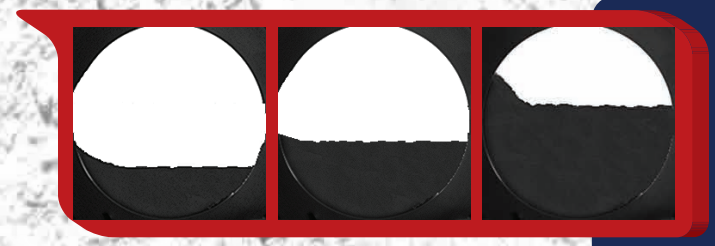
The flowability of powders is compared by measuring the avalanche and surface properties of the powders as they rotate in the sample drum. In the Power Spectrum Graph, the avalanches cycles for the Red Sample are longer and stronger than the avalanche cycles of the Blue Sample. This indicates that the Blue Sample will flow easier and smoother than the Red Sample.



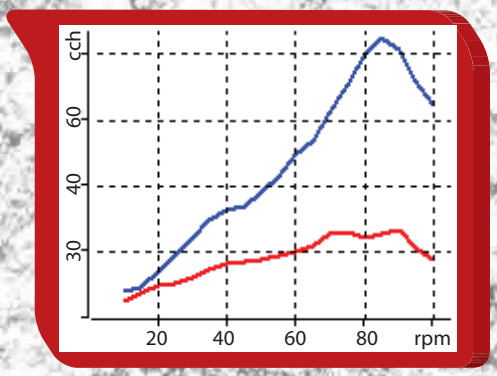
Cumulative Power Spectrum - Granulation

GRANULATION & CAKING

When a powder is rotated in a drum, the continual angular velocity can cause the powder's particles to join together to form large particles or break apart to form small particles. Generally, the flow properties improve with the formation of large particles and worsen with the formation of small particles. By monitoring the flow properties of powders over time and under different rotation speeds, the Revolution Granulation Test measures the granulation rate, strength of granules or caked particles and de-agglomeration rate of the powder.



Fluidization Process



Comparison of Fluidization Rate of Two Powder Samples

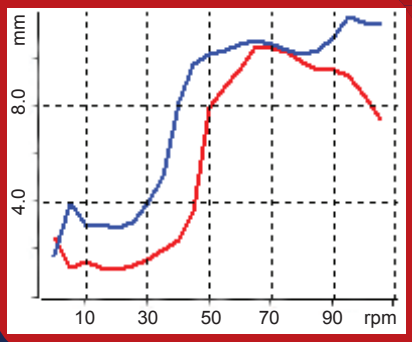
FLUIDIZATION

A powder is fluidized when a gas is injected into the powder causing the powder particles to separate and enter a fluid state. For fine powders, the gas pressure required to fluidize the particles is very low and can be created by rotating the powder in a drum. The fluidization of a fine powder can be studied by measuring the volumetric expansion of the powder at different drum rotation speeds. After the fluidization analysis, the Revolution Fluidization Test measures the settling time of the powder. In the Fluidization Comparison Graph, the analysis shows that the Blue Sample fluidized more rapidly than the Red Sample and to a much higher fluidization volume.

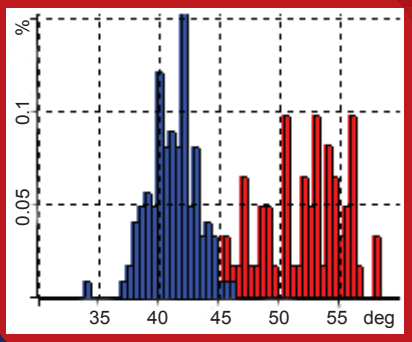
Revolution Powder Analyzer

APPLICATIONS

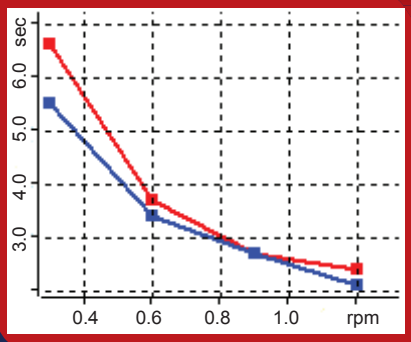
For All Graphs: Blue Sample performs better than Red Sample.



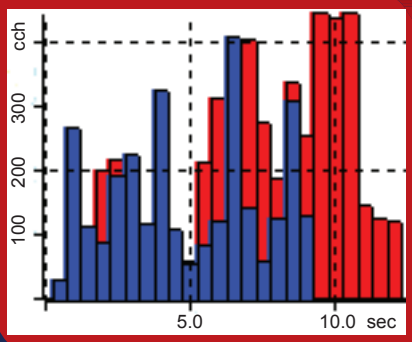
Fluidization Height
Catalyst



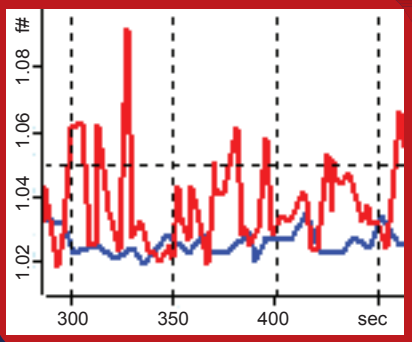
Avalanche Angle
Food Powder



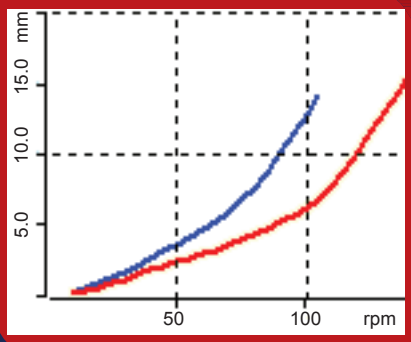
Rotation Function
Epoxy



Granulation Spectrum
Cosmetic Powder



Fractal Analysis
Pharma Tablet Blend



Fluidization Cumulative
Toner

MEASUREMENTS

For Flowability, Granulation & Caking Tests:

Avalanche Median	Median Variance
Avalanche Power	Power Variance
Avalanche Time	Time Variance
Avalanche Hurst	Power Average
Power Variance	Power Slope
Avalanche Angle	Rest Angle
Angle Delta	Sample Volume
Surface Fractal	Fractal Hurst
Surface Linearity	Correlation Hurst
FFT Average Time	FFT Power

For Fluidization Tests:

Height Slope	Height Linearity
Volume Slope	Volume Linearity
Initial Settling %	Initial Settling Time
Initial Settling Slope	Final Settling %
Final Settling Time	Final Settling Slope
Settling Change	Power Slope

PHYSICAL CHARACTERISTICS

Instrument Size:	24 in x 9 in x 9 in
Contact Materials:	Glass & Aluminum
Powder Sample Size:	75cc or 125 cc
Drum Rotation Rate:	0.1 to 200 RPM
Computer Conn:	RS-232 & 1394 Firewire
Operating System:	Windows XP
Power Requirements:	80-230 Volts, 3 amps

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