

CAN YOU MEASURE POWDER FLOWABILITY?

What are powders and bulk solids?

Granulated materials, like sugar and flour, comprise this group called “bulk solids” and can range in size from sub micron particles to large rocks and minerals. Unlike liquids which, under the influence of gravity, tend to have a horizontal surface, powders exhibit a structure, due to internal friction, which allows them to form piles with angles relative to the surface on which they are placed. At ambient conditions, powders do not change flow behavior when subjected to variable shear rates, whereas most liquids do. When loaded into a hopper, pressure can increase the strength (i.e., increase the internal friction) of a powder, whereas a liquid will show limited change in rheology under pressure. The consequence is that the powder gains strength and flows less easily.

What are the industrial issues with powders for food processors?

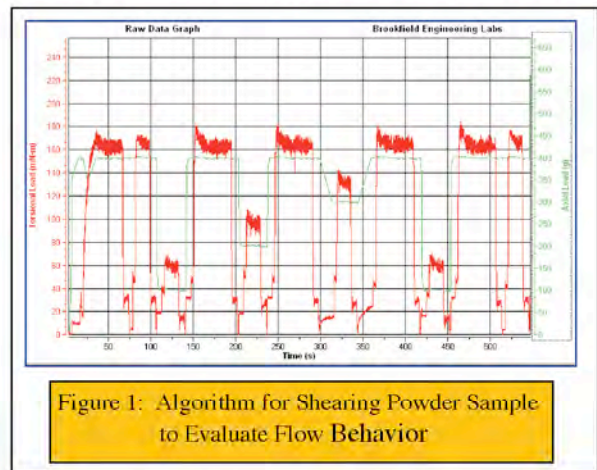
The classic problem is their failure to discharge reliably from bins, hoppers, feeders, etc. This causes unwanted interruptions in the production process, leading at times to complete plant shutdown in order to correct the flow restrictions and stoppages.

Quality Control Departments are constantly dealing with raw materials in powder form, which come from multiple suppliers. The variability in particle size, moisture content, and basic ingredient make-up requires a battery of incoming inspection tests, none of which assure that proper flow will take place when loaded into the plant equipment.

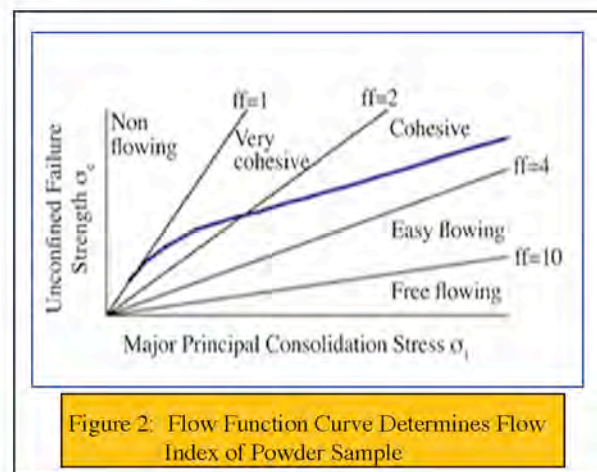
R&D Departments are constantly adjusting formulations of powder products to satisfy customer demand for improved properties: better coating action for batters, enhanced taste for spices, rapid dissolving of powders when put into solution. New powder formulations do not necessarily have the same flow properties as before, thereby leading to production problems when the process is scaled up to high volume.

How can flow problems with powders be eliminated?

There is a proven scientific method, called the “flow function test”, which can analyze powders for flow behavior. ASTM D6128 describes this procedure for compressing and shearing powder samples in a defined



cell. (Figure 1) The resulting data produces a “flow function”, much like what is obtained for liquids when testing with a viscometer to create a “flow curve”. (Figure 2) Analysis of the “flow function” leads to calculation of the dimensions required for the size of opening at the bottom of the hopper to achieve reliable discharge of the powder.



Although ASTM D6128 has existed for many years, the instrumentation used to accomplish the test has been expensive to purchase, requires an experienced operator, and may need a technical expert to interpret the results.

Brookfield's Powder Flow Tester (Figure 3) is the welcome answer to the food industry's need.



Figure 3:
Brookfield Powder Flow Tester

An untrained person can run tests and collect data within minutes. The automated analysis provided by the Powder Flow Pro software calculates the hopper opening for reliable powder flow. The bottom line for food companies processing powder materials is that the long-established scientific method for evaluating powder flowability is now commercially available at an affordable price!

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