WEIGHING for EFFECT
or
PLANNING for SHRINKAGE

Food manufacturers of powder-based products must consider both weight and volume when packaging their goods. Use of a weight measurement ensures that each package provides the guaranteed portion due the customer. Volume of the product during the fill process, however, is oftentimes greater than the perceived amount in the bag once in the customer's hands. This is due to consolidation of the powder which takes place in the intervening time period.

How do manufacturers know what this shrinkage factor will be? And will it cause a problem for the customer if they think that they are being cheated?

The important fact to understand is that powders naturally consolidate with time due to their self-weight. The "loose-fill density" is the physical attribute that characterizes the powder at the outset. Voids in the powder, which occur naturally during the filling process, gradually disappear as the particles rearrange themselves. The air entrapped during filling gets squeezed out and the particles achieve a closer packing condition which in turn increases the density.

Figure 1: Example of Shear Cell Instrument: Brookfield Powder Flow Tester

One type of instrument that can predict this change in density is called a "shear cell". (See Figure 1) The powder is poured into a container of defined volume, weighed, and the calculation for "loose-fill" density is computed. (See Figure 2) Then a lid, which fits on top of the container holding the powder, presses down on the sample to predefined consolidation stress levels. As the lid compacts the powder, the sample volume in the container reduces. Successive calculations are performed to compute the increasing density values. The graph in Figure 3 shows how the density changes as a function of consolidation for several different cocoa powders. This entire measurement procedure takes less than 5 minutes for each powder and all density calculations are performed automatically.

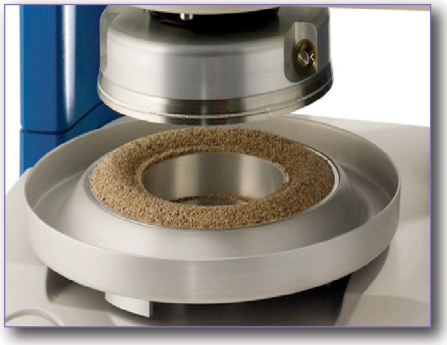

Figure 2: Container with Powder in Loose-Fill Condition

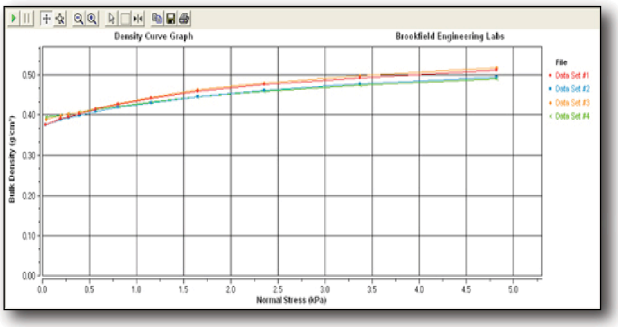

Figure 3: Density Graph for Powder with Increasing Consolidation

It's worth noting that some powdered products, like confectionary sugar, are compressible to over 50% of their loose-fill volume. These are the types of products that cause the consumer the greatest concern because the unfilled volume in the package is equivalent to the amount of product contained therein.

Passage of time is another parameter to consider in using a shear cell to predict potential changes in density. Transport of the product to the consumer invariably involves shelf time in a warehouse. Many powders will continue to consolidate in these circumstances. The shear cell has the capability to perform what is called

a “time consolidation test”. This gives a picture of how the powder will naturally settle due to its own self weight.

In conclusion, fill volumes for powder products are certainly important, but do not tell the whole story. Investigation of how powders settle and reduce in volume is something to consider. This may help explain why consumers feel they are not receiving fair value because shrinkage in the package is substantial.

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