

Quick QC Test For Pretzel Filling



Figure 1:
Brookfield LFRA
Texture Analyzer

Stuffed, or filled, pretzels have become a popular snack food. A very quick and easy QC test for the “stiffness” and “flowability” of whatever filling is used can be set up using a small, low cost Texture Analyzer and a back extrusion cell. (see **Figure 1**) A back extrusion cell is simply a cylindrical cup that is filled, in this case, with either soft cheese or peanut butter. A disc-shaped probe is then pressed into the cell, forcing the material to flow around behind it as it descends. (see **Figure 2**) This type of test is called “back extrusion” and is as simple to set up as it sounds: Fill up the cup, level it off and place it on the test table.



Figure 2:
Back Extrusion Cell

Such a test could even be done manually by just pressing the probe into the cheese. However, the automation afforded by using a Texture Analyzer guarantees a meaningful quality check.

In order to get useful information from the test, the probe must travel at a constant speed while the Texture Analyzer (see **Figure 3**) monitors the amount of force with which the sample resists. The graph shows a plot of the load curves generated from duplicate tests of two different kinds of cheese filling and another of peanut butter filling. The duplicate curves prove the repeatability and sensitivity of such a test, except for the clearly indicated entrapped air bubble when the cell was loaded with one of the cheese samples. Two analytical parameters to be extracted from this test are apparent modulus and the work expended during probe descent.

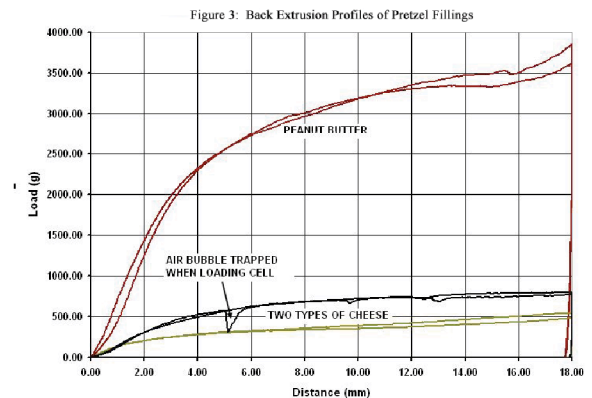


Figure 3:
Back Extrusion Profiles of Pretzel Fillings: Graph of Force vs. Distance for Extrusion Cell Test on Soft Cheese and Peanut Butter

Apparent modulus is the initial slope of the curve in grams/mm and is analogous to the “stiffness” of the sample. For softer fillings, the slope of the curve will trend similarly to the cheese fillings; for fillings that are more stiff, similar to the peanut butter filling. The work expended is a calculation of the area under the curve in milli-Joules and is analogous to its resistance to flow. Result statistics are shown in **Table 1**.

SELECTED CALCULATIONS	Peanut But.	Peanut But.	Cheese A	Cheese A	Cheese B	Cheese B	
Apparent modulus	1,407	1,316	131	149	278	348	g/mm
Work done to hardness 1	25,212	25,879	3,358	3,056	5,715	5,544	mJoules

Table 1: Test Data Calculations Using Texture Analysis on Peanut Butter and Cheese Fillings

The test speed in examples shown was 2mm/s. Since the total travel distance was 18mm, a test takes 9 seconds, and the software at the end of each test automatically calculates results. Sample preparation is easy; be careful to not entrap air bubbles or at least recognize their effect when you see them and maintain a stable sample temperature for the best comparison.