Pull to Open . . . . If You Can?

Figure 1: Brookfield CT3 Texture Analyzer for Compression and Tension Testing

Figure 2: Tension Test on Snack Package Using Brookfield CT3 Texture Analyzer

Figure 3: Detail of Package Seal in Dual Grips for Tension Test

One of the most frustrating things about packaged snacks is trying to open the bag. We've all experienced the hassle with a package of snacks or chips that requires more force than we can apply to peel apart the seal. Or how about the package that tears with the seal still intact. When the package fails, it's usually so abrupt that the contents end up on the floor or in your lap!

Quality Control continues to wrestle with this type of packaging issue. The design of snack bags requires an adequate seal to preserve freshness, secure the product during transportation and handling, and still allow for convenient opening for consumers. This article describes a simple, straightforward method for studying and evaluating packaging seals. Most importantly, it uses an existing instrument within the food industry to perform the testing - a standard benchtop Texture Analyzer (see Figure 1) which has the capability to compress and/or pull apart materials.

The first step in conducting such a study is to prepare the package for testing. The package shown in Figure 2 has been taken from a granola type snack bar. The package in its original form is first cut across its center so that the package seal is at the end opposite the cut. Each half is then flattened and the edges trimmed to form a one inch wide strip with the seal in the center of the test strip (see Figure 3). This test strip is then secured in the dual grip jaws with the package seal midway between the grips.

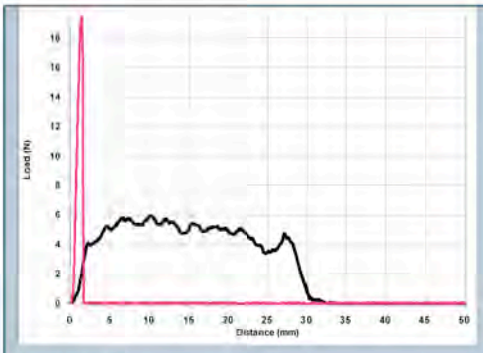
During the tension mode test, the grips separate at a constant speed, pulling the seal apart while the resulting force (load in pounds or Newtons) is recorded in a data table as a function of distance and time. This data is also displayed graphically for a quick visual reference of what is happening during the pulling action.

Graph 1 shows two separate tests which display the load force in Newtons as a function of distance in millimeters. In one test th seal peeled apart quite uniformly and with reasonable force (the black line). In the other, a much higher force is recorded over a very short distance as the sample stretched (the red line), then the package abruptly failed without any separation of the seal. This is the package that would spill its contents in your lap, or on the floor, as the package suddenly ripped while you were applying increasing pressure on it! As you can see, the graph can show a lot of detail about the physical structure of the seal closure as it is pulled apart.

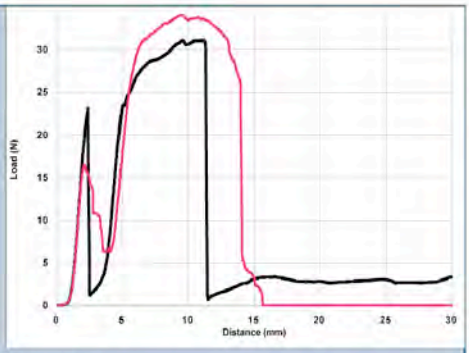
Different sealing processes result in different physical properties of the seal. These differences can be easily interpreted from the graphical test result. Graph 2 shows an identical test of a different package seal. As the grips move apart the package stretches a little more than 2mm until the seal begins to open so the force suddenly decreases. From about 4mm into the test until almost 15mm, the remainder of both seals peel apart with a force of just over 30 Newtons, approximately 7 pounds of force. You'll notice the force curve in black suddenly drops to a low force level at about 12mm, then continues to show 3 Newtons all the way until the end of the test. This package has a plastic liner laminated to the inside of the outer foil. (The package represented by the red line does not have a liner.) At 12mm the foil was observed to fail leaving only the plastic liner connecting the two ends. Since the plastic liner by itself stretches so easily, it stretched all the way to the end of the test without separating.

A simple test such as this can give a lot of information about the physical characteristics of a packaging seal and how it will behave when opened. Since many food companies have a texture analyz-

er, it is important to realize that this instrument can do a lot more than just analyze food texture. It can also tell us about the physical properties of the packaging. And now that these instruments are easily affordable, it's time for QC to expand its services and evaluate the package as well as the contents. When it's time to pull, make sure that you've done your homework.



Graph 1:
Load vs Distance Data for Two Different Package Seals



Graph 2:
Load vs. Distance Data for Two Similar Package Seals, One with a Plastic Liner

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