

FRUIT FOR THOUGHT? . . .

THE SNACK INDUSTRY IS MAKING FRUIT POPULAR

Quality control in food processing strives to achieve manufacturing consistency. We have recently seen a rapidly growing number of high energy snack foods introduced to the market. Fruit flavors seem to dominate these brands. The products themselves often

are bite sized, chewy nuggets containing fruit juice, sugar and other quick energy supplements. Every brand is distinguished from all others at least partially by a collection of physical properties: commonly firmness, chewiness and stickiness. Compression testing is a great way to measure these properties and can be easily done with today's texture analyzer. (See Figure 1)



Figure 1: Brookfield CT3 Texture Analyzer

The samples that were tested for this article arrived to us in sealed, retail packages. When considering possible test methods to measure the physical properties, it is most useful to get an understanding of the relevant sensory characteristics. A rudimentary sensory test is always in order. Eat some of them. What do you most notice about them? Firmness, stickiness and possibly chewiness seemed to be the most obvious properties of this particular sample.



Figure 2: Brookfield Confectionary Fixture with Cylindrical Probe

Bite sized pieces of soft and somewhat sticky snacks must be held in place for such testing. The device in the photo is a confectionary fixture (See Figure 2) and is a very convenient way to quickly position and secure samples. Of the physical prop-

erties we can address with a texture analyzer, firmness and stickiness can be measured with a single compression test. By choosing the proper probe and accessory only minimal sample handling is required.

These samples had opposing flat, parallel surfaces, so it was easy to hold each piece in place using the confectionary jig. A cylindrical probe (See Figure 2) was used to penetrate each sample at a constant speed and distance so that the probe would stop before it got too close to the base. Typical load curves are shown in the graph. (See Figure 3) The height of the peak, and the level of the plateau after the peak indicate the firmness of the sample. Useful statistics-

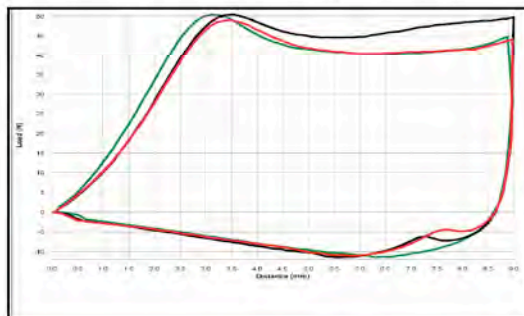


Figure 3: Force Load Curve for Fruit Snack Piece

for firmness are Hardness (peak value – See Figure 4)

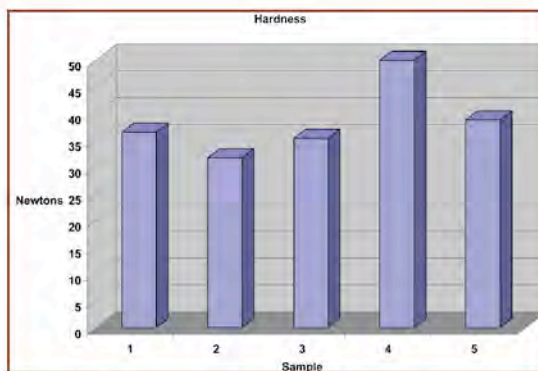


Figure 4: Hardness Data for Fruit Snack Pieces

and Work (integrated area under the curve during the entire compression stroke – See Figure 5).

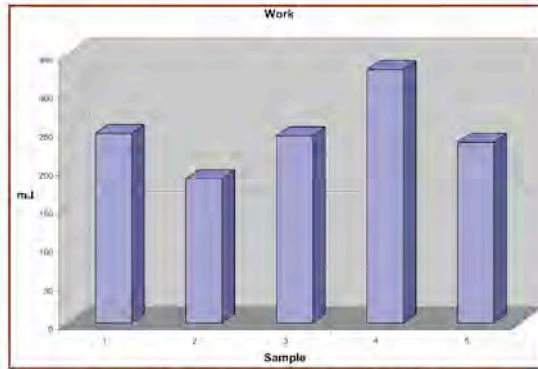


Figure 5: Work Data for Fruit Snack Pieces

The negative load values indicate the stickiness of the sample. Useful statistics for stickiness are adhesive force (the peak negative load – See Figure 6) and adhesiveness (the area of the curve below zero

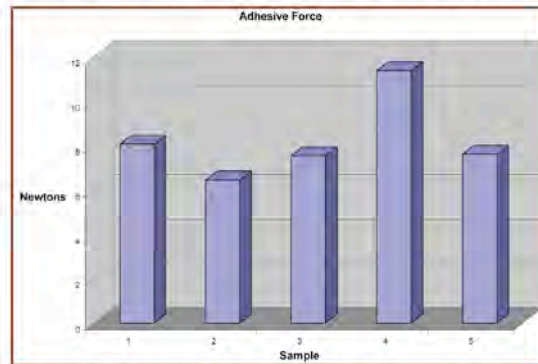


Figure 6: Adhesive Force Data for Fruit Snack Pieces

load – See Figure 7). The charts show each of these result parameters for all five of the samples tested.

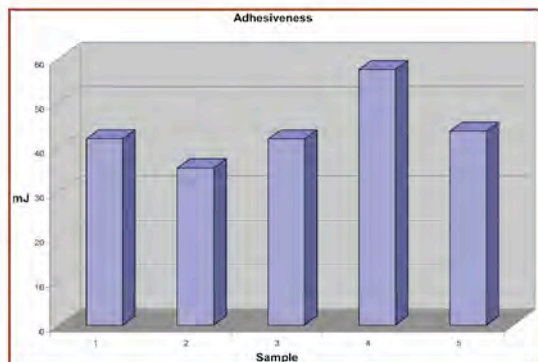


Figure 7: Adhesiveness Data for Fruit Snack Pieces

The testing described above is quick and easy, and appears to detect significant differences between the samples. One rather interesting phenomenon in this data is that the test results between the five samples appear to bear the same relationship regardless of which statistic is studied. It stands to reason that the compressive forces of work and hardness would be related to each other, as would the retraction forces of adhesive force and adhesiveness. But it is quite interesting that the compression forces and the retraction forces all bear a very similar relationship across all samples.

Texture analyzers can be very useful in quality control for establishing and maintaining product consistency. Today's texture analyzers have evolved so they are now easy for anyone to use and are priced low enough to be considered for routine QC applications.