

The Role Of Texture Analysis In Food Manufacturing

A Q&A with David Brookfield, President and CEO, Brookfield Engineering Laboratories

David Brookfield is president and CEO of Brookfield Engineering Laboratories, the company his father, Donald Sr., founded in 1934. Brookfield Engineering Laboratories manufactures viscometers and rheometers for laboratory and on-line process control applications.

Prior to being elected president and CEO in 1998, Brookfield held various positions with the company, including vice president of engineering. He directed the company's product transition from analog to digital technology in viscosity measurement and is the inventor of Brookfield Engineering's torque tube technology, which permits in-line measurement of viscosity. Brookfield holds degrees in mechanical engineering and physics from the Massachusetts Institute of Technology.



In this Q&A, Brookfield discusses the current role of texture analysis in food processing, explains the top three things you should consider when investigating the use of a food analyzer in your plant, and considers the current and future role of texture analysis in the food industry.

What is texture analysis, and why is it important in food processing?

Texture analysis is the practice of testing physical properties of food products, usually by compression. Physical testing of food products by texture analysis can tell us a lot about its tactile properties, such as firmness, fracture-ability, resilience, and other parameters.

There are two primary reasons for measuring these properties:

1. Tactile properties affect the consumer's sensory perception and acceptance of a food product. Once the range of sensory acceptability is determined, a texture analysis test can be constructed to distinguish between an acceptable and unacceptable product.

2. Physical properties of food affect the design of processing equipment. Quantifying these physical properties is helpful in selecting and adjusting the equipment used to mix, transport and package products.

How does the food industry measure texture today?

When we first entered the food business in March of 2003, I was surprised to learn that many companies were measuring (and I use the term “measuring” loosely) physical properties of the material with very elementary types of tests. For example, does a spoon stand up in the product for a certain length of time? If the product is picked up with a spoon how long will it take for the first drop fall off? These are not very scientific methods, but they are intuitive. If a quick test of physical properties is this subjective, the results are quite variable and the test accuracy is not very good.

More objective methods for measuring texture have been developed, but they were still too expensive to be practical in most QC environments. Objective measurements require a force gauge of some sort. Ideally, a motor driven mechanism compresses the product under test at a steady rate while measuring the load response. It doesn't seem like an expensive piece of equipment would be required to conduct such a test, but with few manufacturers supplying the necessary equipment, the price was too high for most mid-sized and smaller companies. Now, with a wider range of texture analysis instruments becoming available, prices are coming down, bringing more objective measurements within reach of even the smallest food manufacturers.

What are the benefits or efficiencies gained by using a texture analyzer?

The benefits of making objective, accurate, and repeatable physical testing can shorten the product development cycle, improve product consistency, and minimize waste. Many of our customers use texture analysis to ensure product consistency across multiple manufacturing locations. Often, separate manufacturing locations will use ingredients from different sources, so ensuring product uniformity via some sort of objective test is a great advantage. Texture analysis is a key tool in this way.

What are the top three factors to consider when investigating the possible use of a texture analyzer in your food plant?

Such decisions always hinge on estimates of cost vs. benefits.

The first benefit consideration is in reference to the manufacturing process itself. Can product variability naturally occur in the process? If so, can process adjustments be made to control this variability? Periodic QC testing is key here, and a texture analyzer can be one of the tools in the QC toolbox.

The second benefit often revolves around raw material supplies. The quality or characteristics of raw materials can often vary between batches or length of storage time. This can affect production and product characteristics. QC testing can determine if these changes are significant.

On the cost side of the equation is the price of the equipment and the skill-level requirements for personnel. Advances in technology are lowering the cost of most test equipment, including texture analyzers. The newest texture analyzers are much lower in price than they have been in the past and have never been easier to use. Even the texture profile analysis test can be run today without a computer, and test results recorded directly off the display.

Please give us a brief introduction to Brookfield Engineering's products and services.

Brookfield has become the company to rely on for laboratory benchtop viscometers over the past 75 years in a wide range of industries, including food. Brookfield's entry into the texture analysis market six years ago has at its foundation a long history of producing economical, high-quality, reliable instruments with excellent customer service and support.

At Brookfield, we stay very involved with our customers as we strive to learn their applications and challenges, in order to help evolve our technology to meet those challenges.

What do you think are the biggest advantages of using Brookfield products to make texture measurements?

The most important advantages of using Brookfield products are that you can count upon knowledgeable customer support, high-quality products at a good value, and local service support through a wide network of dealers, wherever you are in the world. The Brookfield Texture Analyzer specifically is extremely easy to use and provides an unmatched depth of test results on its display without the need for a computer and software. However, by adding a computer and software, you raise the power of the analyzer to that expected in university food science programs and corporate R&D facilities.

How is Brookfield's product development affected by changes in the food industry?

As the food industry changes in response to consumer demands and expectations, the variety of products evolves and grows. A large variety of new food products are appearing as prepared, ready-to-eat meals or very quick-to-prepare products in individual- and family-size packaging. As the food industry changes, its requirements also change. Brookfield works very closely with our customer base, and with new customer inquiries, to fully understand how our products must develop to meet these needs. It is our in-depth relationship with our customers that allows us to follow emerging market trends and develop the products, necessary to meet their needs.

What do you think the future holds for texture analysis in the food industry?

As the instruments become simpler to operate and lower in price, companies of all sizes will be able to employ them for quality control testing. Brookfield will continue developing new applications, new test accessories, and new probes to meet the testing demands of an ever-increasing range of products and applications.

One of the significant evolutions taking place in the food industry is the increasing use of texture analysis in QC to perform final acceptance tests on a broad range of products, including puddings, breads, snack foods, etc. The breakthrough is the price point for texture analyzers, along with increased education of personnel. Brookfield's contribution is notably the recent introduction of the CT3 Texture Analyzer which provides a base price of \$5,495 for the instrument and a la carte pricing for test probes (cylinders, cones, punches, ball) at \$64 each. Heretofore, food companies were spending a minimum of \$15,000, and more likely over \$20,000 once fixtures and probes were added in.

On the technical side, the need to duplicate textural qualities of low-fat and fat-free formulations for many food products necessitates testing that can quantify the similarities and differences in a meaningful and reproducible way. Texture analyzers provide this capability.

Use of software to set up more elaborate test methods is one of the challenges that lie ahead. This speaks to the fact that there are many ways to test a given product and that there is no single approved procedure in most cases. Len Thibodeau, our product manager for texture analysis, is chair of the ASTM E18 Committee, which is investigating the correlation between sensory testing (performed by humans who fulfill the important function of qualifying new formulations) and the ability of instrumentation to mimic/duplicate the type of information that these panels produce when evaluating food products.

It's an exciting time in the world of texture analysis, and Brookfield has a prominent role to play as methods are refined and, in some cases, standardized.