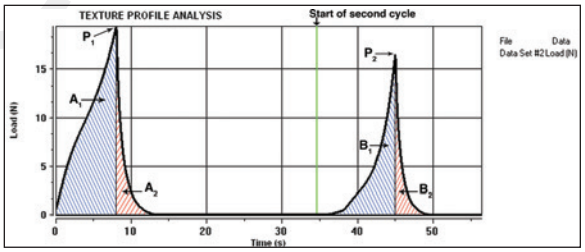
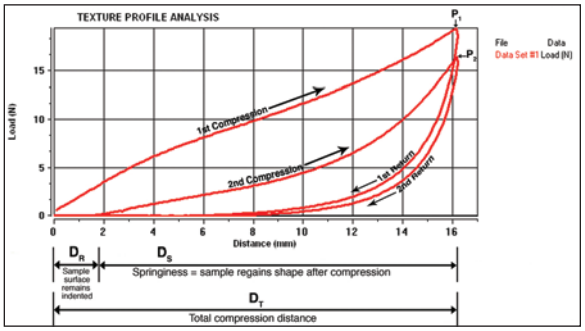
What is texture analysis?

Texture analysis is primarily concerned with measurement of the mechanical properties of a product, often a food product, as they relate to its sensory properties detected by humans. Fifty years of texture research has developed a set of definitions relating the sensory properties of a product to the instrumental properties which can be calculated from the results of a two cycle texture profile analysis test. Texture analyzers perform this test by applying controlled forces to the product and recording its response in the form of force, deformation and time.

These graphs show two ways of looking at the data from one 2 cycle Texture Profile Analysis test. The force vs time graph clearly shows the force peak resulting from each compression cycle, while the force vs distance graph better displays the response of the sample to the application and removal of strain.





PARAMETERS	SENSORY DEFINITION	INSTRUMENTAL DEFINITION	
Hardness	Force required to compress a food between the molars (Defined as force necessary to attain a given deformation)	Peak force of the first compression cycle	P_1
Resilience (PELEG, 1976)	Measurement of how a sample recovers from deformation in relation to speed and forces derived	Resilience is the ratio of work returned by the sample as compressive strain is removed (known as recoverable work done A_2), to the work required for compression (known as hardness work done A_1)	$\frac{A_2}{A_1}$
Adhesive Force (Fiszman and Damaio, 2000)	The maximum force required to separate teeth after biting sample	Maximum negative force generated during probe return	
Adhesiveness	The work necessary to overcome the attractive forces between the surface of the food and the surface of other materials with which the food comes into contact (e.g. tongue, teeth, palate) (Work required to pull food away from a surface)	The negative area for the first bite, representing the work necessary to pull the compressing plunger away from the sample (No adhesiveness is seen in graphs above)	
Springiness Index Preferred for comparing samples of different lengths	Ratio of the height the sample springs back after the first compression compared to the maximum deformation	Springiness divided by total deformation	$\frac{D_S}{D_T}$
Cohesiveness A measurement of how well the structure of a product withstands compression	The strength of internal bonds making up the body of the product (Greater the value the greater the cohesiveness)	The ratio of the work during compression (downward stroke only) of the second cycle B_1 divided by that of the first cycle A_1	$\frac{B_1}{A_1}$
Corrected Cohesiveness (PELEG, 1976)	Net work invested in the non-recoverable deformations of the first and second chews	The ratio of the net work of the second cycle $B_1 - B_2$ divided by that of the first cycle $A_1 - A_2$	$\frac{B_1 - B_2}{A_1 - A_2}$
Chewiness Solid foods only	The energy required to chew a SOLID food to the point required for swallowing it	The product of hardness, cohesiveness and springiness	$P_1 \times \frac{B_1}{A_1} \times D_S$
Corrected Chewiness	The net energy required to chew a SOLID food to the point required for swallowing it	The product of hardness, corrected cohesiveness and springiness	$P_1 \times \left(\frac{B_1 - B_2}{A_1 - A_2}\right) \times D_S$
Gumminess Applies to semi-solid products only if they have no springiness & undergo permanent deformation	Energy required to disintegrate a SEMI-SOLID food product to a state ready for swallowing (Related to foods with low hardness levels)	The product of hardness and cohesiveness	$P_1 \times \frac{B_1}{A_1}$

Why Choose AMETEK Brookfield?

AMETEK Brookfield is recognized around the world for offering high quality measurement instruments at an affordable price. Unsurpassed customer support is but one more reason to choose an AMETEK Brookfield product when you are considering a viscometer, rheometer, texture analyzer or a powder flow tester. To find out about the in-depth service that we provide, ask any customer who has uses one of our viscometers.

The CT3 offers the highest performance/cost ratio on the market. Distance accuracy is assured during calibration for each and every CT3 by storing the unique compensation curve for load cell deflection. Each load cell deflects naturally and uniquely as the force builds to the maximum range for the load cell. This unique deflection of each load cell is stored during calibration and applied to the drive system in real time as the test runs. This compensation assures accurate distance travel regardless of the load force recorded.

The CT3 Texture Analyzer utilizes uni-axial compression and tension forces in combination with a selection from our extensive list of probes, grips and fixtures to test a wide variety of food, personal care products and industrial materials. Most tests desire to imitate conditions imposed on these products during manufacture, handling, and consumption or use. Characterizing the physical properties of your products in such an analytical manner provides "real life" insight and can be invaluable toward maintaining consistent, high quality manufacturing while minimizing cost.

The AMETEK Brookfield Texture Department can also provide customers with complete texture assessment service. We specialize in the development of novel and innovative test applications and accessories for solid and semi-solid materials, enabling our customers to maximize the practical value of their texture studies within all test environments.

AMETEK Brookfield's compact design of the CT3 has a long heritage dating from the Stevens gelatin Bloom tester. The CT3 still contains the Bloom test method and we now offer the complete gelatin bath preparation system along with GMIA and GME approved Bloom bottles. The system includes a CT3, a rack allowing easy handling of twelve Bloom bottles, two TC-450MX large reservoir baths and a TC-351 chiller.

CT3 Gelatin System

Why Measure Texture?

Consumer products succeed in the marketplace in part because their "textural characteristics" are pleasing to customers. This is certainly true with food products but it also applies to cosmetics, pharmaceuticals, packaging, industrial materials and even adhesive type materials.

Applications

Quality Control, Product Development and R&D

FOOD

Dairy	Bakery	Snack Foods	Meat	Fruit & Vegetables
Butter	Bread	Chips	Beef	
Cheese	Dough	Confections	Poultry	
Tofu	Pastry	Granola Bars	Seafood	
Yogurt			Surimi	

COSMETICS & PERSONAL CARE

Creams	Eye liner pencils	Lipstick
Mascara	Powder compacts	Soap bars

PHARMACEUTICALS

Adhesive dressing	Gelatins	Inhalation	Syringe testing
Tablet hardness	Topicals	Transdermal	

MATERIALS

Adhesives	Caulking	Grease	Packaging
Paste	Rubber	Wax	

Properties Measured

Adhesiveness	Apparent Modulus	Breaking Point
Burst Strength	Chewiness	Coefficient of Friction
Cohesiveness	Consistency	Elasticity
Fracture Force	Gel Strength	Gumminess
Hardness	Pliability	Relaxation
Ripeness	Spreadability	Tackiness
Yield Point		