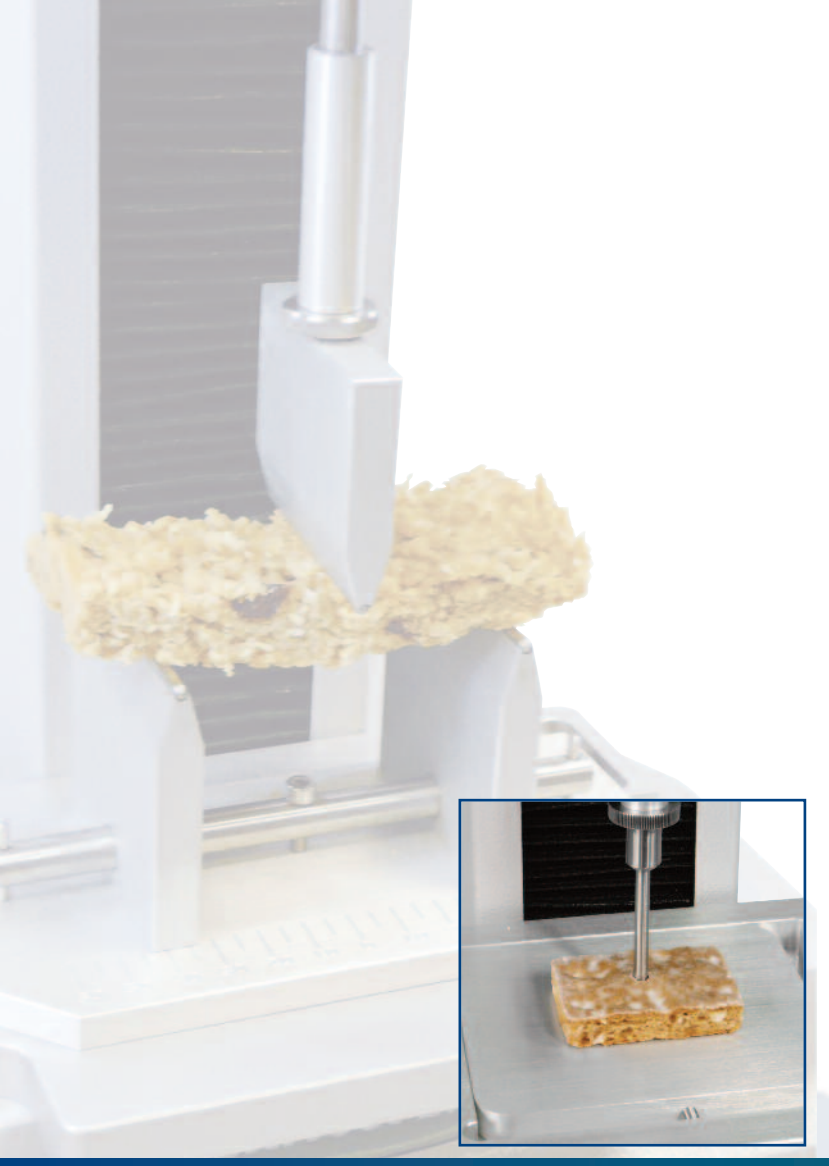
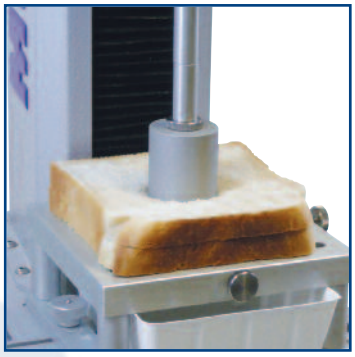
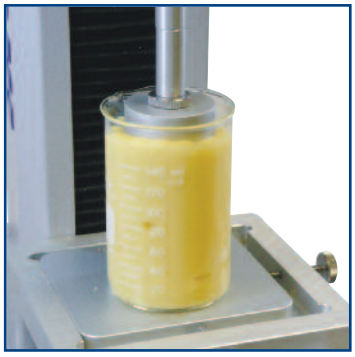
Food Technology Corporation

Your path to consistent quality







Bakery

Spectronic CamSpec Ltd

Some simple guidelines for texture testing...

www.spectronic-camspec.co.uk

Spectronic CamSpec Ltd

What does Texture Analysis mean to the Bakery Industry?

The textural profile of bakery products is critical to consumer selection and perception. Bakery products have a narrow range of associated textural characteristics recognized and anticipated by the consumer. The consumer often interprets any deviation from this ideal as a loss in quality. Prime objectives of the commercial bakery are to develop products; which fit within this narrow textural spectrum, maintain these characteristics consistently throughout production, and ensure that textural quality does not deteriorate during the products' specified shelf-life.

Instrumental texture analysis combined with sensory expertise are invaluable tools for the measurement of bakery texture.

- From a ***manufacturer's*** perspective, a biscuit producer may want to optimize the texture of the dough fed to a rotary molder - they want it hard enough not to stick to the mold, but soft enough to fill it!
- From a ***customer's*** perspective, this could be the springiness of fresh bread; the consumer wants it springy to appear fresh while the ready-made sandwich producer needs it strong enough to withstand mechanical handling.

Some Texture Analysis Experiences with the Total Quality Loop

RESEARCH & DEVELOPMENT

"...texture profile analysis enabled us to investigate the effect of amylases on the extension of bread shelf-life"

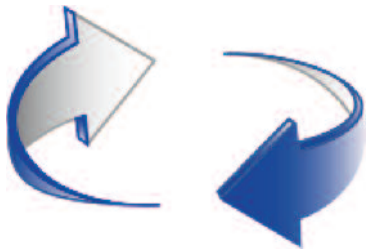
"...we used it to investigate the effect of microbial transglutaminase on puff pastry and croissant tenderness"

QUALITY DEPARTMENT

"...texture analysis gave us an objective means to measure crumb texture of our bread so that it was firm enough to go through the slicer"

"...texture testing gave us a way to check the hardness of shortening before we added it to our puff pastry"

Total Approach to Quality



PRODUCT DEVELOPMENT

"...texture analysis helped us to measure the effect of shortening substitution in a low fat muffin product"

"...we used it in the development of a pastry pie lid suitable for the microwave"

PROCESS DEVELOPMENT

"...texture testing helped us to optimize the oven profile used in the baking of our digestive biscuits"

"...we used simple penetration testing to perfect the mixing and handling conditions of our short textured dough in relation to behaviour in the rotary molder"

How do I know that I need to measure the texture of bakery products?

Food texture analysis is primarily concerned with how food material feels, behaves and performs. There are two approaches that can be taken to measure food texture:

Sensory based

Texture treated as a perception or human experience, which is correlated to what we feel.

Engineering based

Texture treated as a condition, which can be monitored and manipulated during manufacture.

Whatever approach is taken, the methods followed should be simple, practical and, most importantly, generate information of "real" value on the product being tested.

Do I have a texture related problem?

Are you getting...?
- Lots of complaints
- Process down-time
- Inconsistent production

Yes → Identified Problem

No

Do you get...?
- High levels of rework
- High levels of rejects
- High levels of concession

Yes → Unidentified Problem

No

Are you...?
- Always correcting processes
- Guessing what to change

Yes → Unidentified Problem

No

Do you have...?
- Poor process and product knowledge
- Lots of new product launches

Yes → Unidentified Problem

No → No Immediate Requirement

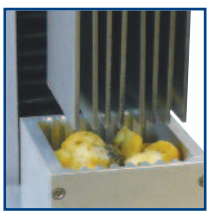
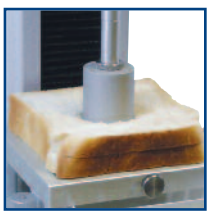
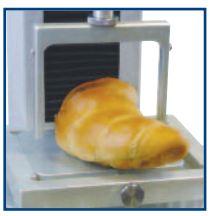
Texture Testing will...
- Improve product consistency
- Reduce process down-time
- Improve customer satisfaction
- Accelerate and reduce development costs
- Minimize quality costs:
  - Loss in reputation
  - Cost of production
  - Devalue brand
- Reduce internal and external commercial pressure for improved product quality

Plus

Even if it looks ok...
- Prevent failure
- Proactive when it needs to be
- Aid continuous improvement
- Understand process and product variation (due diligence)

Spectronic CamSpec Ltd

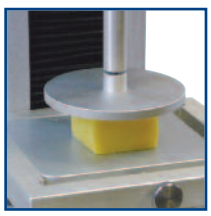
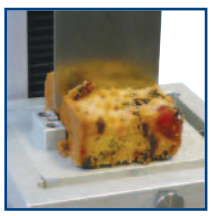
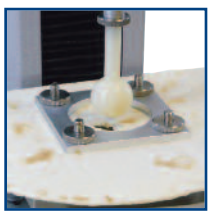
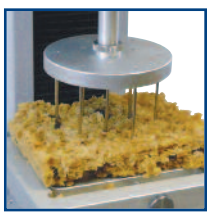
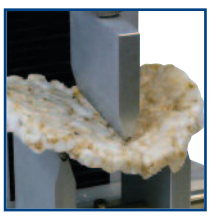
Product	Description	Core Characteristics
Viscous Liquids Sugar Syrups & Glazes Batters Purées & Concentrates Custards, Creams & Spreads	Thick and viscous concentrated liquids with unsupported structures and high soluble solids content. Made from processed fruits, sugars, fats or blends of ingredients to form pumpable semi-solid slurries, which must be tested within holding containers.	• Deposit tailing (stringiness) • Whipped strength and aeration • Flow and structural recovery • Mouthfeel and coating • Consistency thickness • Gelling profile
Particulates Biscuit Pieces Croutons Mixed Peel & Dried Fruit Chocolate Chips Fruit Preparations Pie Fillings	Small, irregular and non-uniform particulate pieces. • **Baked** products have brittle or expanded structures • **Dried** fruits have sticky, fibrous dense consistencies • **Fruit** and **vegetables** are fleshy with soft moist textures • **Chocolate** and confectionery pieces are hard and waxy • **Meats** have non-uniform fibrous, solid structures	• Freshness and crunchiness • Baking resilience • Effect of moisture migration • Hydration and bowl life studies • Moisture-related toughness • Roasting properties • Meat toughness • Fruit integrity
Homogenous Solids Bread & Bagels Muffin & Sponge Cakes Doughnuts American Style Pancakes Crumpets	Homogenous, highly elastic products baked to form rigid aerated structures. High degree of elasticity is expected when fresh, which reduces as product becomes stale. Viscous element becomes apparent when tested beyond elastic memory or as moisture content decreases.	• Staling • Crumb hardness • Elasticity and recovery comparisons • Crust toughness • Consistency & failure properties over time • Shelf-life prediction & changes • Baking & oven profile
Multilayered Puff Pastry Croissants Danish Pastries	Multilayered and expanded or risen textures made up from lots of thin, laminated layers. Products have a high fat content, which coats individual layers during cooking.	• Lift properties • Breakdown resilience • Toughness • Staling changes
Brittle Solids Biscuits Bread Sticks Wafers Tacos Crackers	Very hard, brittle and open textures that fracture easily when deformed, e.g. cut, snapped, penetrated or squashed. Exhibit a single massive failure, almost like an explosion when small amount of stress is created.	• Storage softening • Checking potential and prediction • Fracture force • Brittleness and friability characteristics • Shortness and breakdown

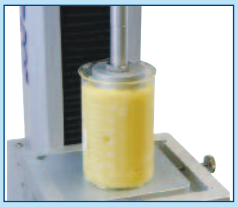
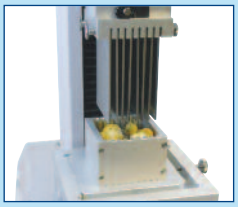
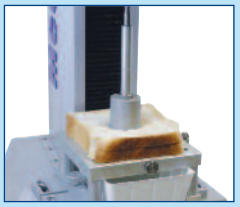
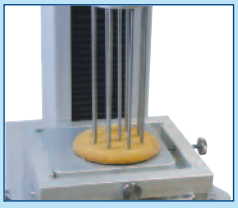

Product	Description	Core Characteristics
Plastic / Viscous Solids Fondants & Fillings Icing & Marzipan Bakery Fats Short Dough	Smooth viscous pastes or weak gels supporting emulsion of particulates. Self-supporting in structure, they can be squeezed, and squashed, cut and spread when exposed to forces beyond their yield or failure point.	• Fat hardness and tempering changes • Work softening during mixing and processing • Sheeting properties • Flow yield force and strength • Gel strength, break and elasticity • Surface stickiness, dough hardness and mold adhesion
Unhomogenous Solids Fruited Loaves & Cakes Christmas Puddings Jams Flans & Quiches	Rigid foams or set gels containing large amounts of suspended particulates. This could be dried fruits, nuts, meats and vegetables, all of which will influence texture measurements if single test location is used.	• Bake profile • Freshness • Gelled strength & elasticity • Crumb variation • Fruit toughness • Crust hardness
Extensible Solids Laminated Or Developed Dough Tortillas & Pancakes Pizza Bases Pitta Breads	Thin and/or elastic products that are torn or stretched during handling or consumption.	• Process consistency • Extension and gluten development • Rollability and toughness • Dough hardness, elasticity & stickiness
Flexible Solids Ginger Bread Flapjacks American Style Soft Cookies	Flexible rigid structures with soft malleable textures. These products bend readily and tend to sag if snapped. High particulate and moisture content, which directly influences texture.	• Oven profile • Flexibility over life • Storage hardening • Chewiness and moisture uptake • Stickiness and tooth compaction
Particulate Solids Crisp Breads Rice Cakes Oat Cakes Muesli Bars	Molded or re-formed self-supporting structures with mixed physical characteristics. Made up from small expanded particulates with crisp outer shell and hollow centres or dense pressed particles.	• Crispness over time • Hardness from bake • Flexibility and softening • Expansion and extruded characteristics

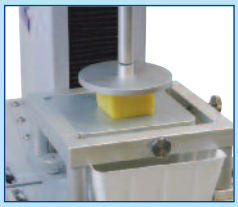
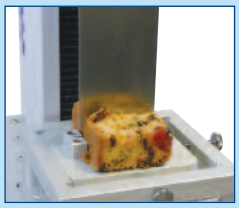
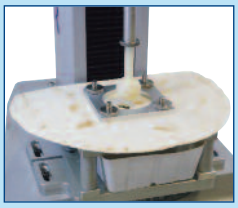
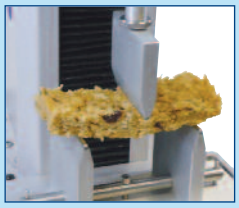
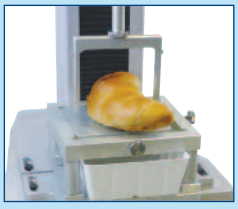
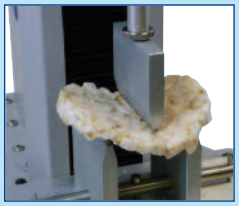
Semi-solid
Flows if unsupported, poured, pumped, extruded or spread during handling or consumption

Solid
Self-supporting structure, deformed, squashed, sheared or snapped during handling or consumption

Choosing The Right Fixture

	Extrusion	Bulk Analysis	Multiple Point Analysis
	Make a thick liquid flow, like getting into a bath of water or pouring a cake batter into a tin	Measure individual pieces in bulk like eating a spoonful of croutons or biting into an apple pie	Multiple site tests are used to measure products with variable textures like pushing a fork into a fruit cake
Viscous Liquids Sugar Syrups & Glazes Batters Purées & Concentrates Custards, Creams & Spreads	• TMS Extrusion Cell (432-026) • TMS Extrusion Cone (432-027) • TMS Extrusion Platen Set (432-029)		Allow decanted samples to recover structure before testing consistency 
Plastic / Viscous Solids Fondants & Fillings Icing & Marzipan Bakery Fats Short Dough			
Particulates Biscuit Pieces Croutons Mixed Peel & Dried Fruit Chocolate Chips Fruit Preparations Pie Fillings	Use multiple blades of Kramer Shear Cell to measure crouton hardness 	• FTC Standard Shear Compression Cell (432-240)	
Unhomogenous Solids Fruited Loaves & Cakes Christmas Puddings Jams Flans & Quiches			• TMS Multiple Needle Probe (432-249)
Homogenous Solids Bread & Bagels Muffin & Sponge Cakes Doughnuts American Style Pancakes Crumpets	Hold containers in place when carrying out extrusion tests with the TMS Container Grips (432-038) 		Large cylinders can be used to press into the centre of sliced bread to measure thickness 
Extensible Solids Laminated Or Developed Dough Tortillas & Pancakes Pizza Bases Pitta Breads			
Multilayered Puff Pastry Croissants Danish Pastries			
Flexible Solids Ginger Bread Flapjacks American Style Soft Cookies	Make hardness measures from cross-section of biscuit to assess checking potential 		• TMS Multiple Needle Probe (432-249) • TMS Junior Multiple Probe Fixture (432-252)
Brittle Solids Biscuits Bread Sticks Wafers Tacos Crackers			• TMS Multiple Needle Probe (432-249) • TMS Junior Multiple Probe Fixture (432-252)
Particulate Solids Crisp Breads Rice Cakes Oat Cakes Muesli Bars			• TMS Multiple Needle Probe (432-249) • TMS Junior Multiple Probe Fixture (432-252)

Penetration	Shearing	Compression	Snapping	Tension
Use small cylinders, balls, needles and cones to push into a sample like pushing your finger into soft icing	Cut across a section of the sample just like biting into a croissant or cutting marzipan	Squash a small sample with a flat or rounded probe like squeezing fresh bread in your hand or squashing with your tongue	Snap bar-type samples with rigid structures to measure their break flexure properties, just like breaking a biscuit in half	Stretch or pull a sample to see how it extends and stretches like pushing your thumb through puff pastry
• 1" Perspex Hemispherical (432-096) • 1" Ball Probes (432-088)			Compress cored samples of viscous pastes to measure deformability 	
• 10mm ø and Smaller S.S. Cylinders (432-066 to 432-074) • TMS FMBRA Dough Pots (432-034)	• TMS Lightweight Blade Set (432-245) • TMS Wire Shear Probe And Plate (432-242)	• TMS 75mm ø Compression Platen (432-010)		
• 2mm ø Needle Probe (432-087)		Shear across sample to measure cutting consistency of particulate products like fruit cake 		
	• TMS Lightweight Blade Set (432-245) • TMS Large Craft Knife (432-295)			Burst strength testing can be used to measure rollability of flour tortillas 
• 1" Perspex Hemispherical Or Ball Probe (432-096 or 432-088) • TMS AACC 36mm ø Cylinder (432-036)		• TMS 75mm ø Compression Platen (432-010)		
		Measure flexure properties and storage hardening of soft bake products 		• TMS Extensibility Fixture (432-046) • TMS Large Wedge Grip Kit (432-297)
	• TMS Large Craft Knife (432-295)			
• 2mm ø Cylinder (432-076) • 15° S.S. Cone (432-085)	Precision shearing with large craft blade gives a good measure of croissant toughness 		• TMS Lightweight Three Point Bend (432-248)	Bend products to assess bonding strength of particulate components in rice cakes 
• 2mm ø Cylinder (432-076) • 15° S.S. Cone (432-085)			• TMS Lightweight Three Point Bend (432-248)	
	• TMS Lightweight Blade Set (432-245) • TMS Large Craft Knife (432-295)		• TMS Lightweight Three Point Bend (432-248)	**Please Note:** Accessories listed in each category are examples of those most suited to the application. Only one accessory is normally required per application to perform the majority of tests.

Food Technology Corporation

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Who is Food Technology Corporation?

Founded in 1966, Food Technology Corporation is the industry's longest standing provider of quality texture measurement systems. With over 40 years experience evolving from the groundbreaking Kramer Shear Press, our company is able to provide systems for the field, factory and laboratory test environments. Our extensive experience in practical food texture measurements, combined with our cost-effective solutions makes us the ideal partner for your texture instrumentation needs.

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