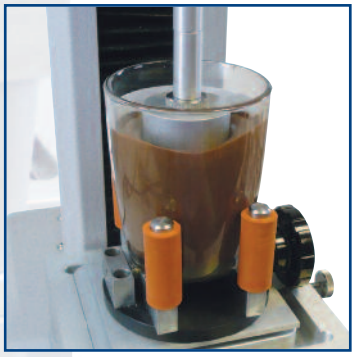
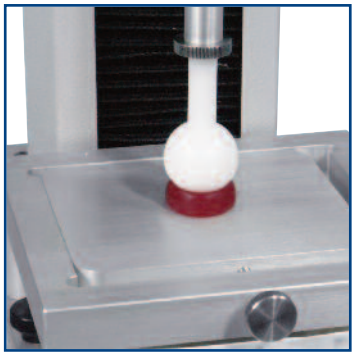
Food Technology Corporation

Your path to consistent quality





Confectionery

Spectronic CamSpec Ltd

Some simple guidelines for texture testing...

www.spectronic-camspec.co.uk

Spectronic CamSpec Ltd

What does Texture Analysis mean to the Confectionery Industry?

Confectionery products have an extremely diverse and variable range of textural properties. Each and every one of these textures has been deliberately designed by product developers to meet market demands. Unique and interesting textural properties are often critical for the success of products in the extremely competitive confectionery market.

Instrumental texture analysis combined with sensory expertise are invaluable tools for the confectionery industry.

- From a ***manufacturer's*** perspective, this could be the functionality of an ingredient within the production process or effect on a finished product.
- From a ***customer's*** perspective, this could be an anticipated or expected sensory profile or the functional performance when used as a component ingredient.

The value of these measurements is reliant upon good sample preparation. If we consider that confectionery is of all different geometries and often multi-layered we can only compare like with like. The kinetic energy formed in different shaped gummy sweets would be highly variable from a simple penetration test.

Some Texture Analysis Experiences with the Total Quality Loop

RESEARCH & DEVELOPMENT

"...texture analysis helped us measure the effect of different fat fractions on chocolate hardness"

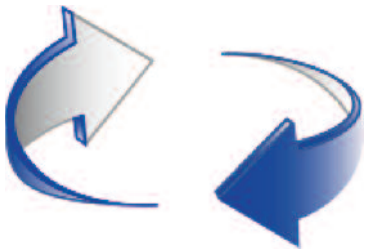
"...we used it to investigate the physical properties of gummy sweets made from gelatin alternatives"

QUALITY DEPARTMENT

"...critical texture qualities identified during development gave us a quality standard for hardness testing of our panned sweets"

"...texture testing gave us a way to check that our soft centers were soft"

Total Approach to Quality



PRODUCT DEVELOPMENT

"...texture analysis enabled us to measure the effect of humidity on surface stickiness"

"...we used it in the development of a sugar-free chocolate bar to see how carbohydrate sweeteners influence texture"

PROCESS DEVELOPMENT

"...texture testing meant we could optimize the cutting process on a nougat line and match customer expectations"

"...we used penetration testing to tell us when our gummy sweets were stoved to the right texture"

How do I know that I need to measure the texture of confectionery 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

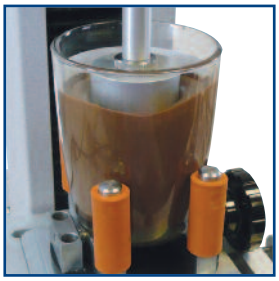
Plus

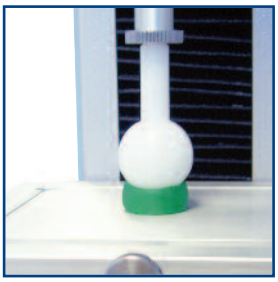
Even if it looks ok...

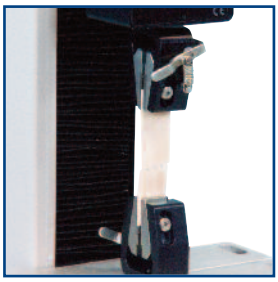
- Prevent failure
- Proactive when it needs to be
- Aid continuous improvement
- Understand process and product variation (due diligence)

Spectronic CamSpec Ltd

Product	Description	Core Characteristics
Pastes & Liquids Syrups Caramel Fondants & Fillings Chocolate Spread	Thick semi-solid products with weak gelled structures. Supplied in containers due to unsupported structure. May contain particulates, such as nuts and dried fruit.	• Deposit tailing (stringiness) • Whipped strength & aeration • Yield properties • Shear thinning & thickening • Physical resilience • Consistency thickness • Gelling profile
Countline Bars Muesli Bars Nougat Chocolate (bars)	Bar or elongated samples with waxy or particulate structures. Consist of large amounts of suspended particles, such as dried fruit, nuts, oats or multilayered.	• Fracture potential • Coating crispness • Flexibility • Hardness to bite
Elastic Solids Gums Jellies Marshmallows Pastels **Extensible Solids** Confectionery Leathers Chewing Gum Sticks Liquorice Strings	Homogenous highly elastic products often incorporating gelling agents and high sugar contents. Relatively soft structures and rubbery texture that does not yield or flow. Will break or rupture when maximum resistance is reached, e.g. when you bite through a jelly with front teeth.	• Storage hardening • Gel elasticity • Gelation characteristics • Rupture strength and resilience • Stoved hardness • Shelf-life changes • Extensibility



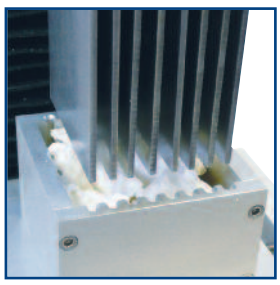
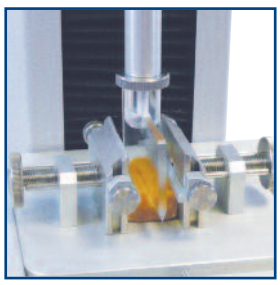
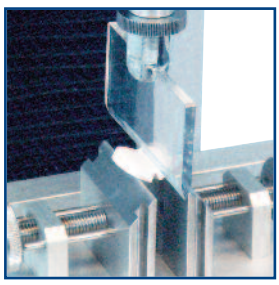
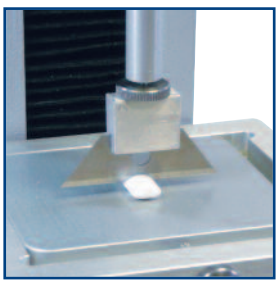




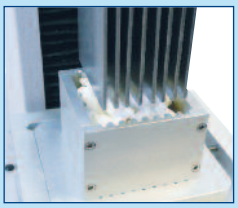
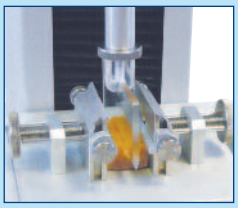
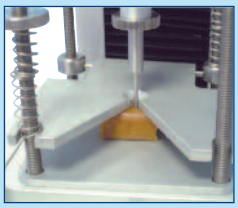
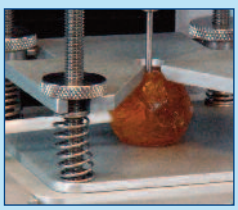
Product	Description	Core Characteristics
Brittle Particulates Honeycomb Pieces Malt Balls Meringue Pieces Biscuit Pieces	Small, irregular and non-uniform particulate pieces with a solid structure. Predominantly consumed or handled in bulk. Averaging affect of multiple blades or penetration can aid reproducibility in snack bar type products with variable textures.	• Moisture migration • Bake hardness • Crispness & fracture properties • Adhesion to blades • Physical structure
Plastic / Viscous Liquids Fudge Toffee Marzipan Taffy Bubble gum	Smooth viscous pastes or homogenous gelled products often with uniform structure. Self-supporting in structure and can be cut or spread when under sufficient stress. Highly elastic when lightly squeezed, but becomes viscous or plastic when maximum resistance is reached. Should it contain particulates, multiple-point analysis is advised.	• Cutting and shearing performance • Tooth packing • Surface stickiness • Storage hardening • Tooth pulling
Brittle Solids Tablets Panned Sweets High Boils	Very hard and brittle structures, which fracture easily when deformed, e.g. cut, snapped, penetrated or squashed.	• Snap strength • Bite resistance • Tempering • Surface adhesion • Brittleness and friability
Dual Textures Jelly Beans Chewing Gum Tablets Panned Sweets	Molded or formed self-supporting structures with mixed physical characteristics often incorporating a crisp or chocolate shell and soft centre.	• Coating crispness • Tooth packing • Filling consistency • Enzyme softening

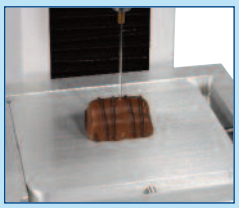
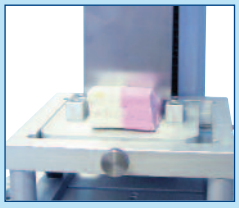
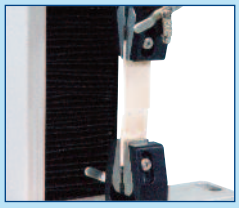
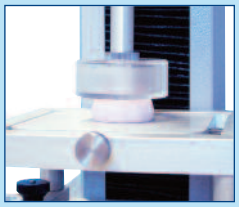
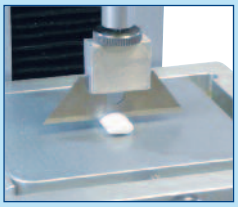
Semi-solid
Flows if unsupported, poured, pumped, extruded or spread during handling or consumption

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

Choosing The Right Fixture

	Back Extrusion	Bulk Analysis	Multiple Point Analysis
	Controlled displacement of thick liquid like getting into a bath of water or pushing the back of a spoon into a syrup	Measure individual pieces in bulk like eating a handful of jelly tots or biting through a muesli bar	Multiple site tests are used to measure products with variable textures like pushing a fork into a nougat bar
Pastes & Liquids Syrups Caramel Fondants & Fillings Chocolate Spread	• TMS Extrusion Cell (432-026) • TMS Extrusion Cone (432-027) • TMS Extrusion Platen Set (432-029) • TMS Aerated Sample Probe (432-030)		
Brittle Particulates Honeycomb Pieces Malt Balls Meringue Pieces Biscuit Pieces	Use the Kramer Shear Cell to measure crispness of biscuit inclusions 	• FTC Standard Shear Compression Cell (432-240) • FTC Thin Blade Shear Compression Cell (432-231)	
Countline Bars Muesli Bars Nougat Chocolate (bars)			• TMS Adaptable Multiple Probe (432-251)
Plastic / Viscous Liquids Fudge Toffee Marzipan Taffy Bubble gum			• TMS Adaptable Multiple Probe (432-251)
Elastic Solids Fudge Toffee Marzipan Taffy Bubble gum	Hold small rectangular samples during testing with TMS mini vice (432-247) 		Penetrate to test single spot hardness and stickiness characteristics 
Extensible Solids Confectionery Leathers Chewing Gum Sticks Liquorice Strings			
Brittle Solids Tablets Panned Sweets High Boils			Measure shattering and friability by penetrating brittle sweets
Dual Textures Jelly Beans Chewing Gum Tablets Panned Sweets			

Penetration	Shearing	Compression	Snapping	Tension
Use small cylinders, balls, needles and cones to push into a sample like pushing your finger into a piece of fudge	Cut across a section of the sample just like biting into a chocolate bar or cutting marzipan	Squash a small sample with a flat or rounded probe like squeezing in your hand or crushing with your back teeth	Snap bar-type samples with rigid or elongated structures using a karate chop like action to measure their break flexure properties	Stretch or pull a sample to see how it extends and resists like pulling a liquorice string from your front teeth
• 1" Perspex Hemispherical (432-096) • 1" Ball Probes (432-088)	Measure internal hardness of soft centre fillings by cutting tops off of chocolates 		Hold containers in place when carrying out extrusion tests with TMS container grips (432-038)	
• 2mm ø Needle Probe (432-087)				
• 5mm ø Smaller S.S. Cylinders (432-071 & 432-074) • 2mm ø Needle Probe (432-087) • 1" Perspex Hemispherical (432-096)	• TMS Lightweight Blade Set (432-245) • TMS Large Craft Knife (432-295)	Cut through bar shaped samples to measure average hardness from cross-section 		Stretch gums and laces to measure elasticity and extensibility 
• 5mm ø Smaller S.S. Cylinders (432-071 & 432-074) • 45° Perspex Cone (432-087)	• TMS Lightweight Blade Set (432-245) • TMS Large Craft Knife (432-295) • TMS Wire Shear Probe and Plate (432-242)		Carry out texture profile analysis on marshmallows and gummy sweets 	
• 1" Ball Probe (432-088) • 5mm ø Smaller S.S. Cylinders (432-071 & 432-074)	• TMS Large Craft Knife (432-295) • TMS Craft Knife (432-019)	• TMS 50mm ø Compression Platen (432-009) • TMS 75mm ø Compression Platen (432-010)		
	• TMS Craft Knife (432-019) • TMS Large Knife Edge (432-017)			• Film Grips (432-215) • Spring Loaded Roller Grips (432-156) • TMS Large Wedge Grip Kit (432-297) • TMS Small Wedge Grip Kit (432-298)
• 5mm ø Smaller S.S. Cylinders (432-071 & 432-074) • 2mm ø Needle Probe (432-087)		• TMS 50mm ø Compression Platen (432-009)	Measure the crispiness of sugar coatings using a craft blade	
• 5mm ø Smaller S.S. Cylinders (432-071 & 432-074) • 1/4" Ball Probe (432-093) • 2mm ø Needle Probe (432-087)	• TMS Large Craft Knife (432-295) • TMS Craft Knife (432-019) • TMS Large Knife Edge (432-017)			**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

Your path to consistent quality

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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