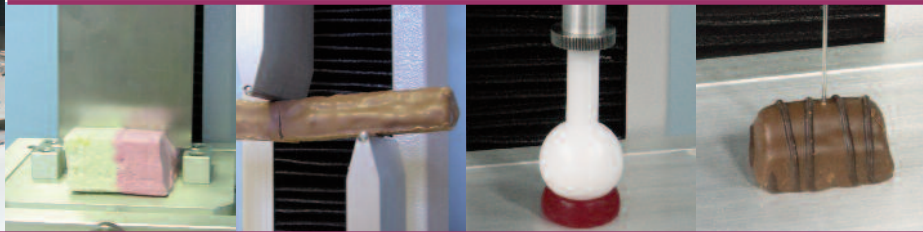




FTC FOOD TECHNOLOGY
CORPORATION



Some simple guidelines for texture testing . . .

Confectionery

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 analyses 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 Within 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 centres were soft"

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"

**TOTAL
APPROACH TO
QUALITY**

PROCESS DEVELOPMENT

"...texture testing meant we could optimise 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 my confectionery product?

Food texture analysis is primarily concerned with how a food material feels, behaves and performs. There are two principle 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.

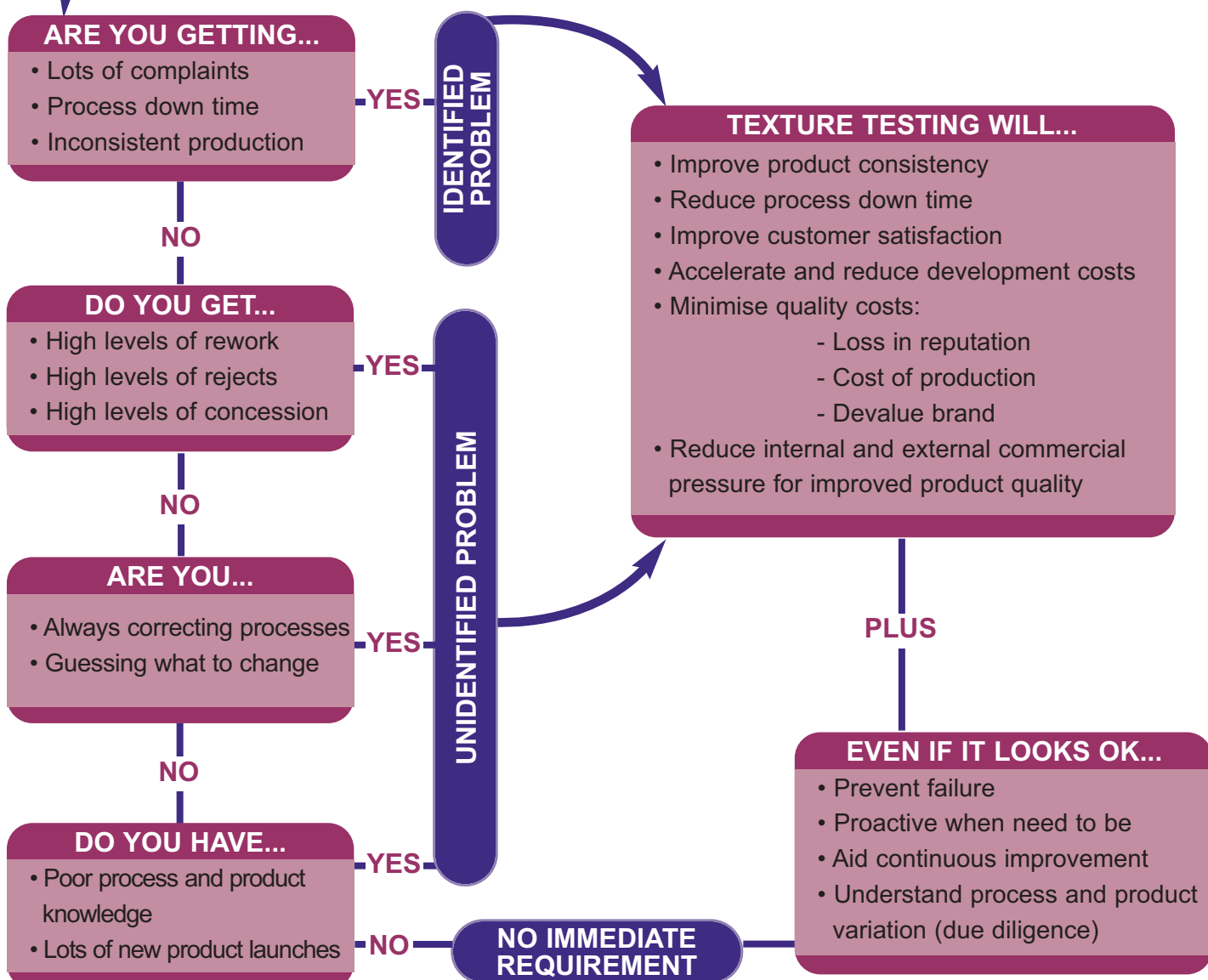


Engineering based

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?



Food Technology Corporation

PRODUCT		DESCRIPTION
PASTES & LIQUIDS SYRUPS CARAMEL FONDANTS & FILLINGS CHOCOLATE SPREAD		<p>Thick semi-solid products with weak gelled structures. Supplied in containers due to unsupported structure. May contain particulates such as nuts and dried fruit.</p>
BRITTLE PARTICULATES HONEYCOMB PIECES MALT BALLS MERINGUE PIECES BISCUIT PIECES		<p>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.</p>
COUNTLINE BARS MUESLI BARS NOUGAT CHOCOLATE (BARS)		<p>Bar or elongated samples with waxy or particulate structures. Consist of large amounts of suspended particles, such as dried fruit, nuts, oats or multilayered.</p>
PLASTIC OR VISCOUS LIQUIDS FUDGE TOFFEE MARZIPAN TAFFY BUBBLE GUM		<p>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.</p>
ELASTIC SOLIDS GUMS JELLIES MARSHMALLOWS PASTELS		<p>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.</p>
EXTENSIBLE SOLIDS CONFECTIONERY LEATHERS CHEWING GUM STICKS LIQUORICE STRINGS		
BRITTLE SOLIDS TABLETS PANNED SWEETS HIGH BOILS		<p>Very hard and brittle structures which fracture easily when deformed, e.g. cut, snapped, penetrated or squashed.</p>
DUAL TEXTURES JELLY BEANS CHEWING GUM TABLETS PANNED SWEETS		<p>Moulded or formed self-supporting structures with mixed physical characteristics often incorporating a crisp or chocolate shell and soft centre.</p>

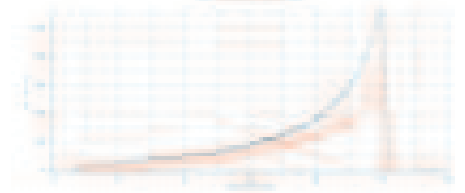
CORE CHARACTERISTICS

SEMI-SOLID
 FLOWS IF UNSUPPORTED, Poured, Pumped, Extruded or Spread during Handling or Consumption

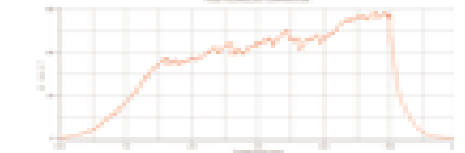
Extrusion comparison between low fat and full fat chocolate spreads



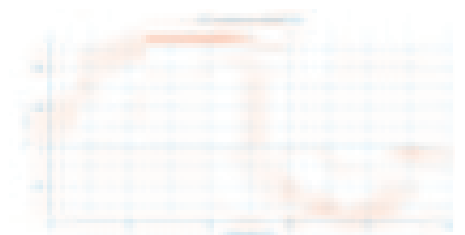
Crispness testing of biscuit pieces



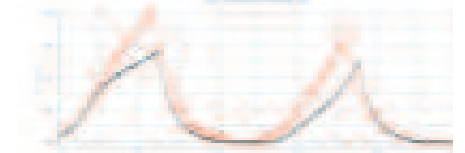
Multiple penetration testing of chocolate bar



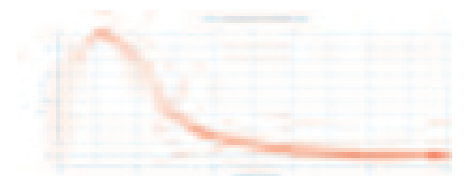
Compression of fudge sample



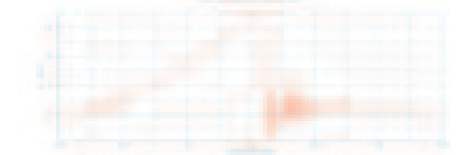
TPA testing of marshmallow at different stage of shelf-life



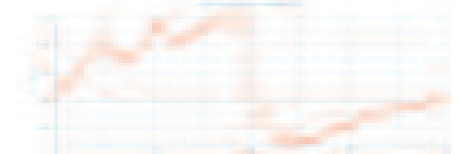
Break strength of chewing gum stick



Penetration testing of boiled sweet



Cutting profile of panned sweet



SOLID
 SELF-SUPPORTING STRUCTURE, Deformed, Squashed, Sheared or Snapped during Handling or Consumption

- Deposit tailing (stringiness)
- Whipped strength & aeration
- Yield properties
- Shear thinning & thickening
- Physical resilience
- Consistency thickness
- Gelling profile

- Moisture migration
- Bake hardness
- Crispness & fracture properties
- Adhesion to blades
- Physical structure

- Fracture potential
- Coating crispness
- Flexibility
- Hardness to bite

- Cutting and shearing performance
- Tooth packing
- Surface stickiness
- Storage hardening
- Tooth pulling


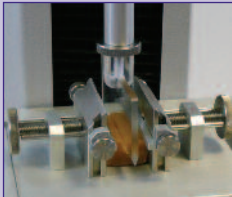

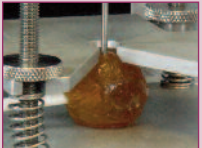
- Storage hardening
- Gel elasticity
- Gelation characteristics
- Rupture strength and resilience
- Stoved hardness
- Shelf-life changes
- Extensibility


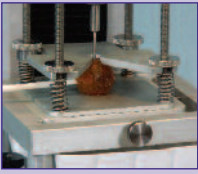



- Snap strength
- Bite resistance
- Tempering
- Surface adhesion
- Brittleness and friability

- Coating crispness
- Tooth packing
- Filling consistency
- Enzyme softening



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 CAMEL 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 COMP. CELL (432-240) FTC THIN BLADE SHEAR COMP. CELL (432-231) TMS MINI KRAMER SHEAR/ OTTAWA CELL (432-033) TMS CRISPINESS CELL (432-296)	
COUNTLINE BARS MUESLI BARS NOUGAT CHOCOLATE (BARS)			TMS ADAPTABLE MULTIPLE PROBE (432-251)
PLASTIC OR VISCOUS SOLIDS FUDGE TOFFEE MARZIPAN TAFFY BUBBLE GUM			TMS ADAPTABLE MULTIPLE PROBE (432-251)
ELASTIC SOLIDS GUMS JELLIES MARSHMALLOWS PASTELS	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
<p>Use small cylinders, balls, needles and cones to push into a sample like pushing your finger into a piece of fudge</p>	<p>Cut across a section of the sample just like biting into a chocolate bar or cutting marzipan</p>	<p>Squash a small sample with a flat or rounded probe like squeezing in your hand or crushing with your back teeth</p>	<p>Snap bar-type samples with rigid or elongated structures using a karate chop like action to measure their break flexure properties</p>	<p>Stretch or pull a sample to see how it extends and resists like pulling a liquorice string from your front teeth</p>
<p>1" PERSPEX HEMISPHERICAL (432-096) 1" BALL PROBES (432-088)</p>	<p>Measure internal hardness of soft centre fillings by cutting tops off of chocolates</p> 		<p>Hold containers in place when carrying out extrusion tests with TMS container grips (432-038)</p> 	
<p>2MM Ø NEEDLE PROBE (432-087)</p>				
<p>5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074) 2MM Ø NEEDLE PROBE (432-087) 1" PERSPEX HEMISPHERICAL (432-096)</p>	<p>TMS LIGHTWEIGHT BLADE SET (432-245) TMS LARGE CRAFT KNIFE (432-295)</p>	<p>Cut through bar shaped samples to measure average hardness from cross-section</p> 		<p>Stretch gums and laces to measure elasticity and extensibility</p> 
<p>5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074) 45° PERSPEX CONE (432-081)</p>	<p>TMS LIGHTWEIGHT BLADE SET (432-245) TMS LARGE CRAFT KNIFE (432-295) TMS WIRE SHEAR PROBE AND PLATE (432-242)</p>		<p>Carry out texture profile analysis on marshmallows and gummy sweets</p> 	
<p>1" BALL PROBE (432-088) 5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074)</p>	<p>TMS LARGE CRAFT KNIFE (432-295) TMS CRAFT KNIFE (432-019)</p>	<p>TMS 50MM Ø COMPRESSION PLATEN (432-009) TMS 75MM Ø COMPRESSION PLATEN (432-010)</p>		
<p>5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074) 2MM Ø NEEDLE PROBE (432-087)</p>	<p>TMS CRAFT KNIFE (432-019) TMS LARGE KNIFE EDGE (432-017)</p>			<p>FILM GRIPS (432-215) SPRING LOADED ROLLER GRIPS (432-156) TMS LARGE WEDGE GRIP KIT (432-297) TMS SMALL WEDGE GRIP KIT (432-298)</p>
<p>5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074) 2MM Ø NEEDLE PROBE (432-087)</p>		<p>TMS 50MM Ø COMPRESSION PLATEN (432-009)</p>	<p>Measure the crispiness of sugar coatings using a craft blade</p> 	
<p>5MM Ø SMALLER S.S. CYLINDERS (432-071 & 432-074) 1/4" BALL PROBE (432-093) 2MM Ø NEEDLE PROBE (432-087)</p>	<p>TMS LARGE CRAFT KNIFE (432-295) TMS CRAFT KNIFE (432-019) TMS LARGE KNIFE EDGE (432-017)</p>			<p>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.</p>

APPLICATION SHEETS

- Compression testing of marshmallows
- Extrusion force of caramel as process indicator
- Consistency measurement of chewing gum tablet
- Comparison between gummy sweet sensory properties
- Shear force of nougat as predictor of formulation change
- Crispness testing of sugar shell confectionery
- Texture Profile Analysis of gummy sweets to optimise process and formulation
- Bite force of different jelly sweets
- Hardness of chocolate
- Crush test of tablet as indicator of drug delivery
- Crush force of high boiled sweet
- Key functional properties of confectionery gel for cake decorating
- Adhesiveness and stickiness of toffee to predict effectiveness of packaging
- Crunch testing of malt ball inclusions
- Extrusion testing of chocolate spread
- Penetration testing of jellybeans
- Shearing of multilayered chocolate bar

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