

# Dairy



Spectronic  
CamSpec Ltd

Some simple guidelines for texture testing...

# Spectronic CamSpec Ltd

## What does Texture Analysis mean to the Dairy Industry?

Dairy products are unique in that they primarily originate from the same base ingredient. Raw milk is condensed, fermented, agitated and acidified to create a whole range of products each with unique textures and flavor profiles. Physical properties and sensory texture play a critical role within the processing behavior, performance and ultimately consumer perception.

Instrumental texture analysis combined with sensory expertise are essential *objective* tools for the identification and measurement of *subjective* textural characteristics.

- From a **manufacturer's** perspective, this could be structural changes during additional unit operations such as grating, slicing, pumping, mixing and depositing, or through formulation changes.
- From a **customer's** perspective, this could be an anticipated or expected sensory profile, where a low fat cheddar cheese should still feel like its traditional full fat counterpart or behave in a pre-specified manner, e.g. a production level.

## Some Texture Analysis Experiences with the Total Quality Loop

### RESEARCH & DEVELOPMENT

"...texture analysis helped us establish how cheese gel hardness affected aroma release"

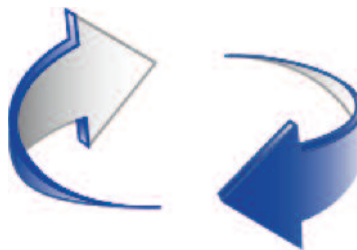
"...we used it to identify which strains of functional bacteria gave us the best texture in yogurts"

### QUALITY DEPARTMENT

"...critical texture qualities identified during research and development were used to monitor our production process"

"...random sampling allowed us to measure the effect of seasonal changes in the setting properties of our yogurts"

### Total Approach to Quality



### PRODUCT DEVELOPMENT

"...texture analysis helped us to measure the effect of using ingredients from different suppliers in our dips"

"...we used it to see how our cheese texture changed during maturation"

### PROCESS DEVELOPMENT

"...texture testing helped us to commission our new fermentation plant so we could maintain the same properties of our Stilton"

"...it increased automation in our dairy to measure shear thinning in our cream cheese"

## How do I know that I need to measure the texture of dairy 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.

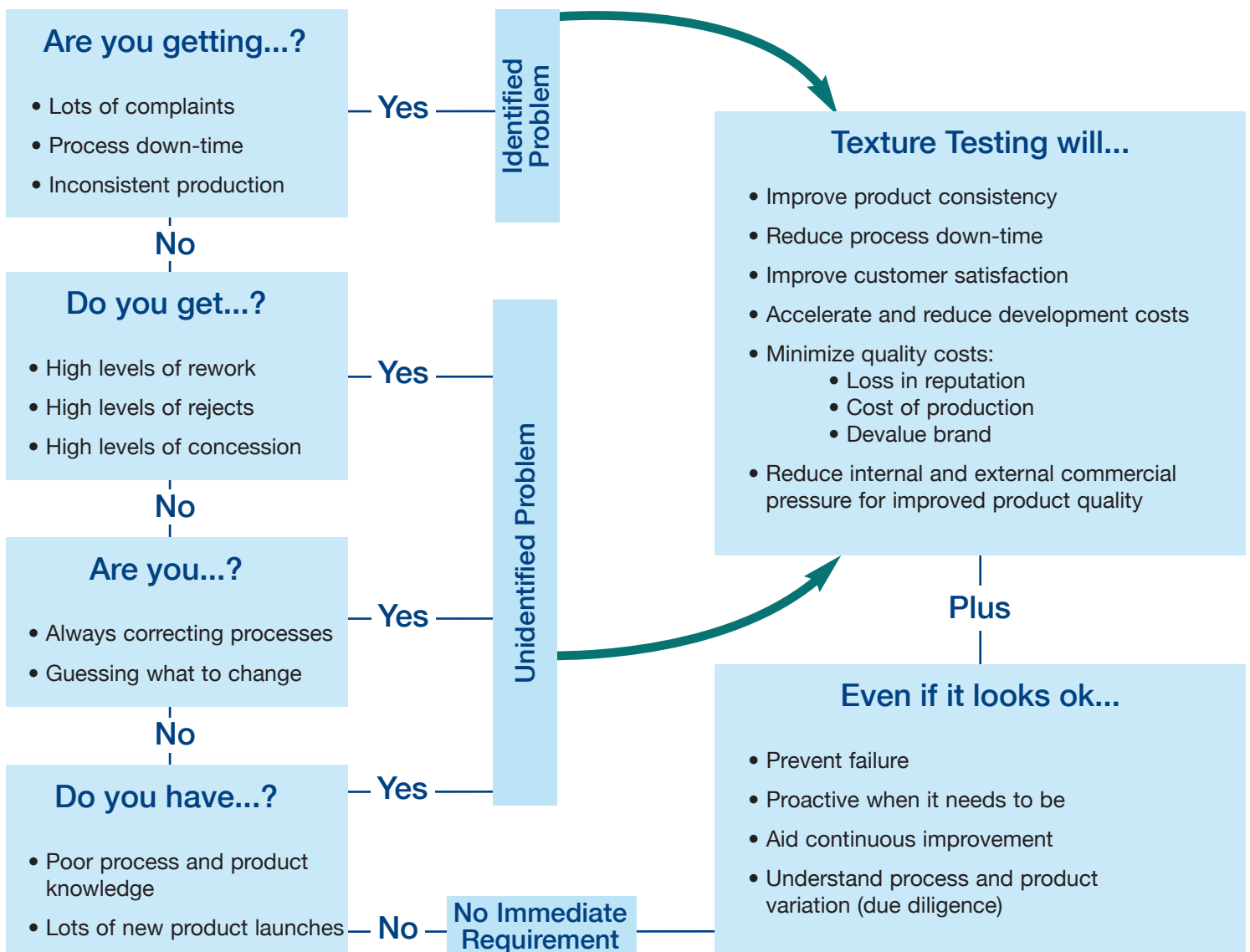


### *Engineering based*

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

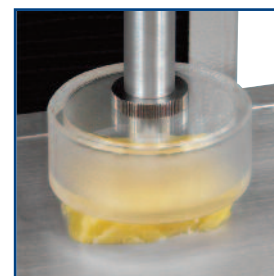
Whatever approach is taken, the methods followed should be simple, practical and, most importantly, generate information of “real” value on the product being tested.

## Do I have a texture related problem?

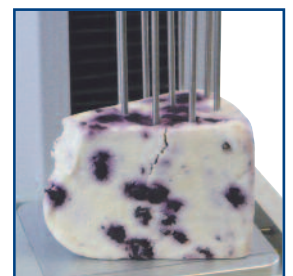
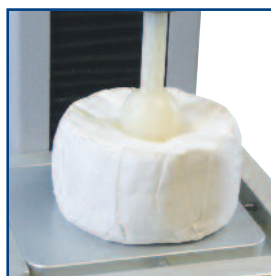
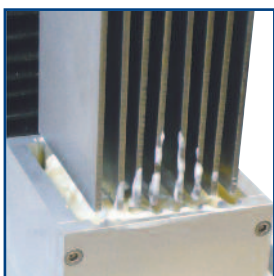


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Product	Description	Core Characteristics
<b>Pastes / Viscous Liquids</b> Dips Mayonnaise Soured Cream Fromage Frais Crème Fraiche Yogurts Whipped Creams Mousse Clotted Cream	Thick semi-solid products with weak gelled structures. Supplied in containers due to unsupported structure. May contain particulates, such as fruit, onions and confectionery pieces.	<ul style="list-style-type: none"><li>• Consistency and body of gelled structure</li><li>• Flow characteristics</li><li>• Shear thinning in pumps</li><li>• Structure recovery</li><li>• Mouth coating</li><li>• Spoonability</li></ul>
<b>Plastic / Viscous Solids</b> Margarine Spreads Butter Cream Cheese Quark Ricotta Processed Cheese	<p>Smooth viscous pastes with uniform structure. Self-supporting at low temperatures, becoming fluid as the temperature rises.</p> <p>Often supplied in container due to temperature-related softening. Butter and some cooking margarines are the exception where fat constituents contained in multiphase emulsion are solid at higher temperatures.</p>	<ul style="list-style-type: none"><li>• Firmness and spreadability</li><li>• Work softening</li><li>• Melting point and temperature related changes</li><li>• Flow yield point</li><li>• Process hardness</li><li>• Adhesiveness</li><li>• Effect of fat type and content variation</li><li>• Aerated texture</li></ul>
<b>Hard Cheese - Waxy &amp; Elastic</b> Mozzarella Feta Paneer Halloumi Edam Stilton Cheddar Parmesan	<p>Predominantly waxy solid materials with low moisture content. Formed from pressed curds, they are generally matured to develop specific textures and flavors.</p> <p>Elastic when lightly compressed and viscous (like plasticine) when squashed to high levels.</p>	<ul style="list-style-type: none"><li>• Sensory comparisons</li><li>• Grating/slicing hardness</li><li>• Surface adhesion</li><li>• Maturity</li><li>• Pressed properties</li><li>• Bacterial degradation</li><li>• Crumbliness</li><li>• Shelf-life changes</li><li>• Moisture migration and surface changes</li></ul>


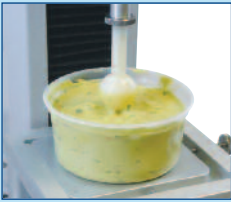
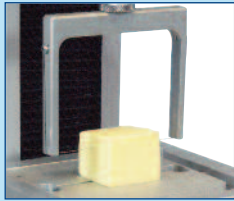
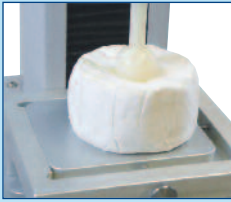
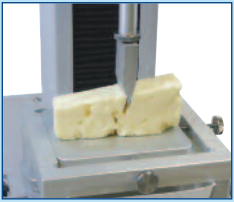


Product	Description	Core Characteristics		
<b>Particulates</b> Fruit Preparations Fruit & Vegetable Inclusions Rice Puddings Cottage Cheese Curds	<p>Small, irregular and non-uniform particulate pieces with viscous solid structure.</p> <p>Consumed or handled in bulk. Multiple blades are used to maximize contact area between instrument and establish averaging effect on measurement.</p> <p>Range from individual grains in cooked and dried state to fruit pieces, dried berries and precipitated milks.</p>	<ul style="list-style-type: none"> <li>• Firmness of curd set</li> <li>• Water holding capacity</li> <li>• Brittleness of curd</li> <li>• Fermentation characteristics</li> <li>• Whey drainage</li> <li>• Press efficiency</li> <li>• Cook quality (rice)</li> <li>• Vegetable freshness</li> </ul>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>Semi-solid</b>            Flows if unsupported, poured, pumped, extruded or spread during handling or consumption         </div>	
<b>Soft Cheese - Creamy &amp; Elastic</b> Brie Camembert\Goats Cheese Port Salut	<p>Soft creamy ripened cheese that soften over life, almost becoming liquified. Often have a rind on the outside, which holds very soft creamy interior. Ripeness can be measured by squeezing to the rind or by measuring the interior resistance.</p>	<ul style="list-style-type: none"> <li>• Ripening</li> <li>• Rind toughness</li> <li>• Elasticity and springiness</li> <li>• Softness and maturity</li> <li>• Shelf-life changes</li> <li>• Sensory comparisons</li> <li>• Melting properties</li> </ul>		
<b>Multilayered &amp; Variable</b> Fruited Cheeses Dual-layered Cheese Ice-cream	<p>Products with non-homogenous textures. Can support particulates of dried fruits, vegetables and nuts or consist of different layers to provide more interest to the consumer.</p>	<ul style="list-style-type: none"> <li>• Inclusion softening</li> <li>• Bulk hardening</li> <li>• Ripening</li> <li>• Shelf-life changes</li> <li>• Breakdown</li> <li>• Moisture migration</li> <li>• Melting properties</li> </ul>		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>Solid</b>            Self-supporting structure, deformed, squashed, sheared or snapped during handling or consumption         </div>



## Choosing The Right Fixture

	Extrusion	Bulk Analysis
<p><b>Pastes / Viscous Liquids</b></p> <p>Dips Mayonnaise Soured Cream Fromage Frais Crème Fraiche Yogurts Whipped Cream Mousse Clotted Cream</p>	<p>Make a thick liquid flow, just like pumping a yogurt or depositing a mayonnaise</p> <ul style="list-style-type: none"> <li>• TMS Extrusion Cell (432-026)</li> <li>• TMS Extrusion Cone (432-027)</li> <li>• TMS Extrusion Platen Set (432-029)</li> <li>• TMS Aerated Sample Probe (432-030)</li> </ul>	<p>Measure individual pieces in bulk like eating a spoonful of cottage cheese or squashing curd together to make cheddar</p>
<p><b>Particulates</b></p> <p>Fruit Preparations Fruit &amp; Vegetable Inclusions Rice Puddings Cottage Cheese Curds</p>	<ul style="list-style-type: none"> <li>• TMS Extrusion Cell (432-026)</li> </ul>	<ul style="list-style-type: none"> <li>• FTC Standard Shear Compression Cell (432-240)</li> <li>• FTC Thin Blade Shear Compression Cell (432-231)</li> </ul>
<p><b>Plastic / Viscous Solids</b></p> <p>Margarine Spreads Butter Cream Cheese Quark Ricotta Processed Cheese</p>	<ul style="list-style-type: none"> <li>• TMS Butter &amp; Margarine Spreadability Jig (432-309)</li> </ul>	<p>Measure curd firmness with the Kramer Shear Cell to assess bulk properties</p> 
<p><b>Soft Cheese - Elastic</b></p> <p>Brie Camembert Goats Cheese Port Salut</p>	<p>Hold containers in place when carrying out extrusion tests with the TMS Container Grips (432-038)</p> 	
<p><b>Hard Cheese - Waxy &amp; Elastic</b></p> <p>Mozzarella Feta Paneer Halloumi Edam Stilton Cheddar Parmesan</p>		<p>Use multiple probes to measure firmness and allow for particles in fruited cheese</p> 
<p><b>Multilayered &amp; Variable</b></p> <p>Fruited Cheeses Dual-layered Cheese Ice-cream</p>		

Multiple Point Analysis	Penetration	Shearing	Compression
<p>Multiple site tests are used to measure products with variable textures like pushing a fork into a fruited cheese</p>	<p>Use small cylinders, balls, needles and cones to push into a sample like pushing your finger into a piece of brie</p>	<p>Cut across a section of the sample just like cutting through a block of butter</p>	<p>Squash a small sample with a flat or rounded probe like squeezing a piece of cheese in your hand</p>
<p>Test samples in pots they are deposited in using extrusion cones or platens</p> 	<ul style="list-style-type: none"> <li>• 1" Perspex Hemispherical (432-096)</li> <li>• 1" Ball Probes (432-088)</li> </ul>	<p>Ball and hemispherical probes can act like pushing your thumb into a thick liquid like dips</p> 	
	<ul style="list-style-type: none"> <li>• 2mm ø Cylinder (432-076)</li> <li>• 4.5mm ø Cylinder (432-072)</li> <li>• 45° Perspex Cone (432-081)</li> </ul>	<ul style="list-style-type: none"> <li>• TMS Lightweight Blade Set (432-245)</li> <li>• TMS Wire Shear Probe and Plate (432-242)</li> </ul>	<p>Use wire shear probe to measure cross-section of sample and follow ISO 16305 (Butter Firmness Standard)</p> 
<p>Use ball probes to press on sample surface and measure ripeness</p> 	<ul style="list-style-type: none"> <li>• 1" Perspex Hemispherical (432-096)</li> <li>• 1" Ball Probe (432-088)</li> <li>• 10mm ø And Smaller S.S. Cylinders (432-066 to 432-074)</li> </ul> <p>Use large knife wedge to create a fracture and split hard cheese</p> 	<ul style="list-style-type: none"> <li>• TMS Lightweight Blade Set (432-245)</li> <li>• TMS Wire Shear Probe and Plate (432-242)</li> <li>• TMS Lightweight Blade Set (432-245)</li> <li>• TMS Wire Shear Probe and Plate (432-242)</li> <li>• TMS Large Knife Edge (432-017)</li> </ul>	<ul style="list-style-type: none"> <li>• TMS 50mm ø Compression Platen (432-009)</li> <li>• TMS 50mm ø Compression Platen (432-009)</li> </ul>
<ul style="list-style-type: none"> <li>• TMS Multiple Needle Probe (432-249)</li> <li>• TMS Junior Multiple Probe Fixture (432-252)</li> </ul>		<ul style="list-style-type: none"> <li>• TMS Large Craft Knife (432-295)</li> <li>• TMS Wire Shear Probe and Plate (432-242)</li> </ul>	<p><b>Please Note:</b> 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>

## 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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