ISO 9001 CERTIFIED

TEXTURE ANALYSIS APPLICATION NOTE:

Cheese Spread Triangles

TEST PRINCIPLE

Evaluation of the firmness and stickiness of two different brands of cheese spread triangles by penetration using a 1-inch spherical probe.

BACKGROUND

Cheese is made from curd by coagulating the casein in milk. The type of curd that develops depends upon the handling techniques, moisture content and aging durations. The texture of cheese can vary depending on the fat content, moisture and protein matrix. An increase in fat content results in a softer cheese as does an increase in moisture content. It is largely the protein matrix that gives rise to rigid forms of cheese. Modifying the nature or amount of protein in cheese will modify its texture.

Texture analysis of the cheese products is necessary in quantifying the curd characteristics so as to predict the final product quality. Using the 1 inch spherical probe, product firmness can be determined. The spherical probe applies a gentle form of deformation on the sample over a specified distance. The maximum force applied is a measure of sample firmness.

With a growing market for low fat foods, texture analysis plays an integral part in the development of low fat products where a developer may want to mimic the textural profile of a product's full-fat counterpart. The CT3 Texture Analyzer using a cylinder probe can determine the consistencies and firmness of soft cheese. Samples can also be tested directly from their containers on the production line.

METHOD

EQUIPMENT:
- CT3 with 4.5 kg load cell
- Spherical Probe, 1-inch (TA-49)
- Fixture Base Table (TA-BT-KIT)
- TexturePro CT Software

SETTINGS:

Test Type:	Compression
Pre-Test Speed:	1.5 mm/s
Test Speed:	2.0 mm/s
Post-Test Speed:	2.0 mm/s
Target Type:	Distance
Target Value:	8 mm
Trigger Force:	4.5 g

PROCEDURE

1. Once the alignment is complete, tighten the thumb screws of the fixture base table to prevent further movement.
2. Commence the penetration test.

Note: When penetrating a sample at various locations, the proximity of neighboring test holes should not be less than 20 mm apart.

The penetration distance can be modified such that greater depth will have decreased softness values and increased adhesiveness values. Consequently, any values obtained are relative to the specified distance and must always be reported for comparison purposes.

For comparison purposes, penetration distances and container size should be kept constant throughout the tests.

The hardest sample is better tested first in order to anticipate the maximum testing range required. This will ensure that the force capacity covers the range of other samples to be tested.

RESULTS

The graphs show the the hardness of full-fat and low-fat cheese spread triangles using a spherical probe.

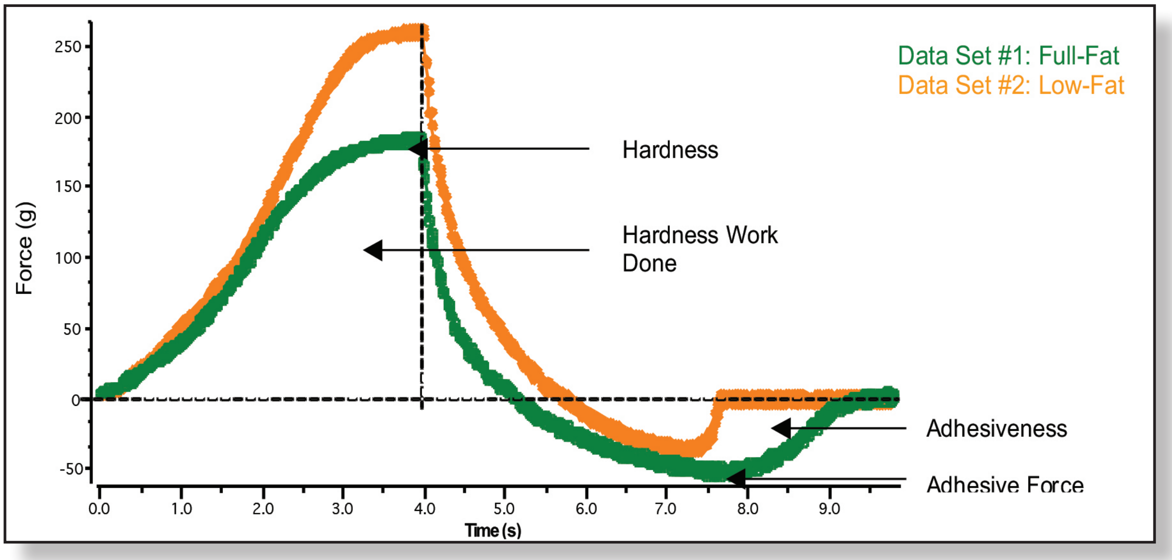

Figure I

Figure I shows the force required to penetrate full-fat and low-fat cheese spread triangles stored at 6°C and tested at room temperature. The maximum force is a measure of sample hardness. The area under the load verses time curve from the start of the test to the maximum force value is a measure of Hardness Work Done. As the male probe withdraws from the sample, a negative force is generated. The maximum force required to separate sample from probe is the adhesive force. The area above the negative peak from the point the probe reaches zero load to the point it completely separates from the sample surface is a measure of adhesiveness (energy required to pull the sample from its surfaces).

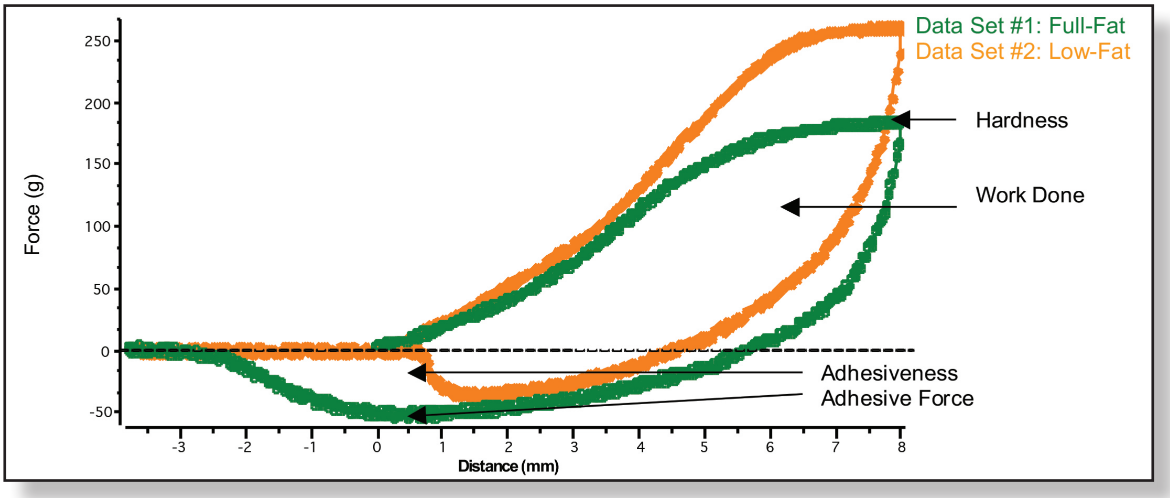

Figure II

Figure II shows force vs. distance for the force required to penetrate full-fat and low-fat cheese spread triangles tested at room temperature. The maximum force at the specified distance is a measure of sample hardness. The area under the load vs. distance curve from the start of the test to the target distance (8 mm) is a measure of Hardness Work Done. As the probe withdraws from the sample, a negative force is generated. The maximum force required to separate sample from probe is the adhesive force. The area under the negative part of the load vs. distance curve is a measure of adhesiveness. Once the probe is fully separated from the sample (at zero load), it returns to the starting position above the sample surface.

OBSERVATIONS

When a trigger force of 4.5 g has been attained at the sample surface, the probe proceeds to penetrate the sample over a specified distance of 8 mm at a test speed of 2 mm/s. The maximum force over the specified distance is a measure of sample hardness (firmness) and the area under the positive curve a measure of the work done (energy required to deform sample). The higher the force value, the firmer the sample. From Figure I, the low-fat cheese spread triangle is firmer than the full-fat cheese spread triangle.

The negative part of the graph is produced as the probe returns to the sample surface. The maximum negative value is a measure of adhesive force (the force necessary to overcome the attractive forces between the sample and the probe with which the sample comes into contact). The area under the negative part of the graph is a measure of adhesiveness (the energy required for the probe to pull away from the sample). From the table below, the full-fat cheese spread triangles are more adhesive than the low-fat cheese spread triangles.

The table below summarizes the mean results of two samples of each product type:

Sample	Hardness (g)	Hardness Work Done (mJ)	Adhesive Force (g)	Adhesiveness (mJ)
Full-Fat Cheese Triangles	179.2 ± 11.5	7.62 ± 0.67	47.7 ± 7.8	2.26 ± 0.55
Low-Fat Cheese Triangles	255.8 ± 6.4	10.54 ± 0.28	40.3 ± 9.7	1.01 ± 0.53