ISO 9001 CERTIFIED
BROOKFIELD AMETEK

TEXTURE ANALYSIS APPLICATION NOTE:

Processed Cheddar Cheese

TEST PRINCIPLE

Evaluation of the cutting force of processed cheddar cheese using a wire cutter.

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 characteristics of cheese can vary in texture, flavor and consistency depending on the manufacturing process. Consequently, cheese can be semisoft, grainy, hard, smooth, crumbly or creamy. Hard cheese, for instance, contains a lower moisture and fat content; therefore, drier and firmer than soft cheese. Hard cheese is also aged longer. 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. As such, reduced fat cheddar (17% fat) is firmer and more elastic than full fat cheddar (35% fat).

The cutting force of processed cheddar cheese is investigated using the CT3 Texture Analyzer fitted with a wire cutter on a 4.5 kg load cell. When the wire blade cuts through the sample, a measurement of the cutting strength (or force) and work done (area under the positive curve) can be made. These measurements are an indication of sample quality and texture.

METHOD

EQUIPMENT:
- CT3 with 4.5 kg load cell
- Wire Shear Plate (TA-WSP)
- Fixture Base Table (TA-BT-KIT)
- Sample Carrier
- TexturePro CT Software

SETTINGS:

Test Type:	Compression
Pre-Test Speed:	0.5 mm/s
Test Speed:	0.5 mm/s
Post-Test Speed:	0.5 mm/s
Target Type:	Distance
Target Value:	30 mm
Trigger Force:	50 g

SAMPLE PREPARATION

Cut the sample into equal rectangles or squares and return to storage (fridge). The width of the sample should be less than if not the same as the width of the wire cutter. Samples should only be removed from the place of storage when ready to test.

PROCEDURE

1. Attach the wire cutter to the instrument.
2. Place the fixture base table to the base of the instrument and loosely tighten the thumb screws to enable some degree of mobility.
3. Insert the wire cutter base plate to the fixture base table and tighten into position using the side screws.
4. Align the slot of the base plate with the wire cutter such that the wire cutter probe can penetrate right through the spacing of the base plate without coming into contact with the plate.
5. Once the alignment is complete, tighten the thumb screws of the fixture base table to prevent further movement.
5. Remove the sample from the place of storage (fridge) and place it on the fixture base plate.
6. Lower the probe and centrally align the sample under the wire cutter.
7. Position the wire cutter a few millimeters above the sample.
8. Commence the test.

Note: Always ensure that the test begins when the wire cutter is in full contact with the sample surface. The test should not start with the wire cutter having sheared the sample to any extent.

If there is irregularity with the sample surface, a higher trigger force may be necessary.

For comparison purposes, the samples should be of similar dimensions and temperature.

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 tested.

RESULTS

The graphs show the cutting force of processed cheddar cheese using a wire cutter.

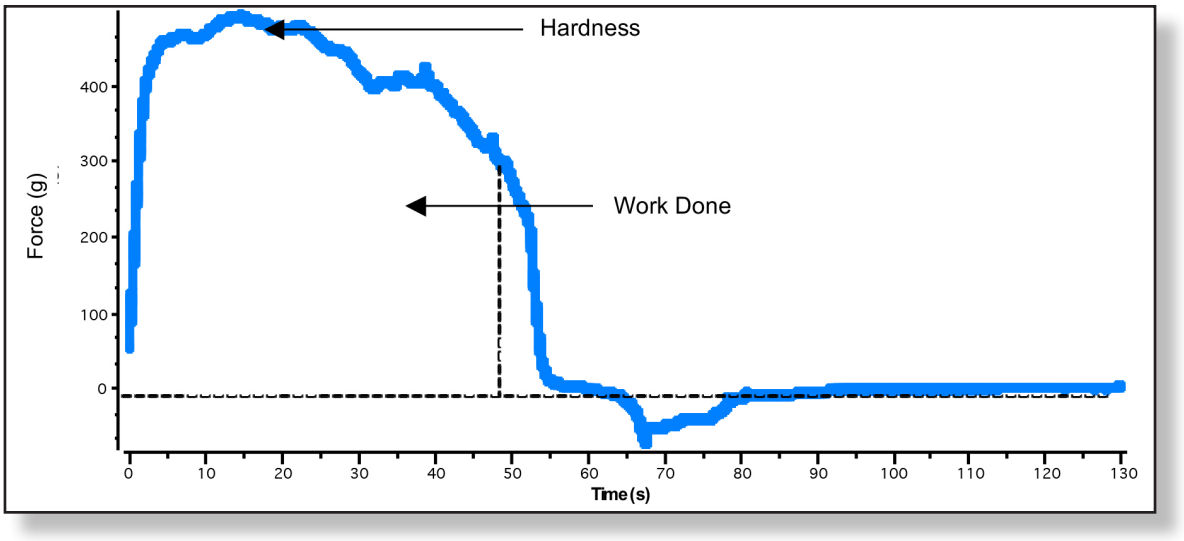

Figure I

Figure I shows the the force required to cut a 90 mm x 30 mm cm block of cheddar cheese stored at 6°C and tested at room temperature. The maximum load value on the graph is a measure of sample hardness. The area under the graph from the start of the test to the maximum force value is a measure of Work done. The negative load values are as a result of the wire cutter reversing its way through the sheared sample.

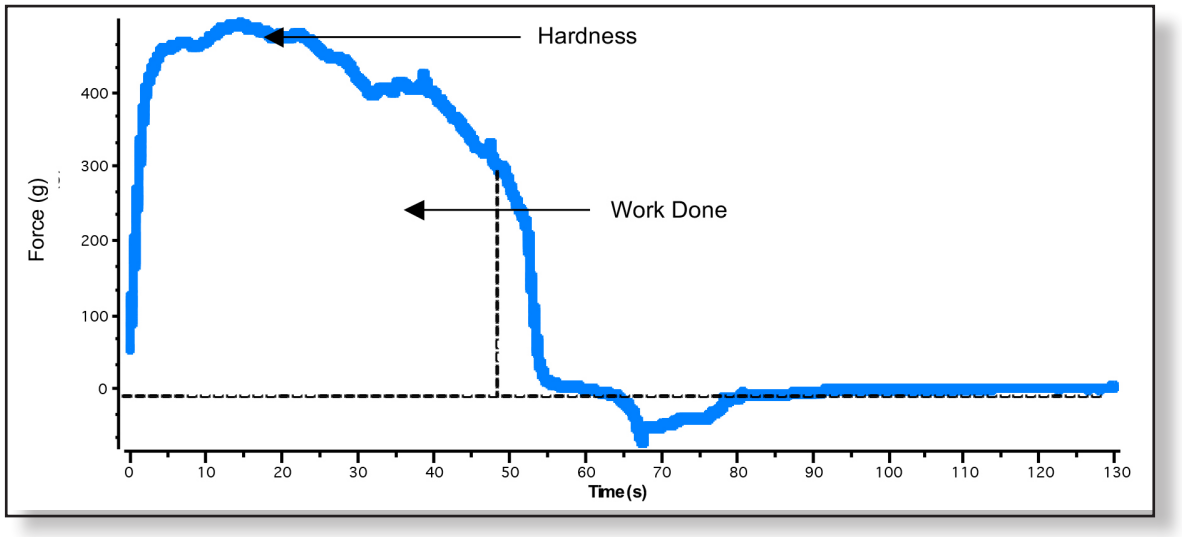

Figure II

Figure II shows force vs. distance for the cutting force of a 90 mm x 30 mm block of cheddar cheese. The maximum load is a measure of sample hardness, and the area under the load vs. distance curve from the start of the test to the target distance (30 mm) is a measure of sample work done. The negative load values are as a result of the wire cutter reversing its way through the sheared sample. The horizontal line at zero load is produced as the probe detaches from the sample and returns to its starting position at the sample surface.

OBSERVATIONS

When a trigger force of 50g had been attained at the sample surface, the wire cutter proceeded to penetrate the sample over a specified distance of 30 mm. The force of penetration was seen to increase rapidly at the start of the test before reaching a plateau. This is a measure of the required force to cut through the sample and is an indication of sample hardness (firmness). The higher the maximum force value, the firmer the sample.

Mean hardness and work done values for three processed cheddar cheese samples are shown below:

Hardness (g)	Hardness Work Done (mJ)
491.3 ± 1.8	109.63 ± 1.45