Application manual No. 115

Production: HAM

Objective: Comparison of shearing force of canned formed vs. reformed ham using a 5-bladed Kramer Shear Cell

Type of action: Cutting test

Test mode settings:

Speed	Test mode	Trigger	Target	Hold
2 mm/s	Distance (c)	100 gf	40 mm	0 sec

Accessory:
Kramer shear cell - 5 blades, Platform

Sample Preparation:
Remove samples from their cans, cover and hold at a controlled temperature e.g. 5C. Cut the meat into equal sized portions. It is important that samples are of the same dimensions in order to make the results comparable.

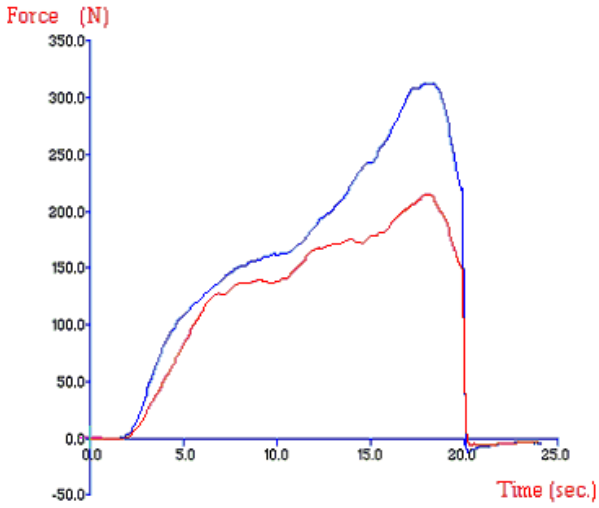
Test Set-Up:
The empty Shear Cell (Perspex front forward) is secured in the Heavy Duty Platform, which is loosely fixed onto the machine base. The blades are attached to the load cell carrier by means of the rapid locating adapter and lowered slowly into the sample cell and through the base slots. The Heavy Duty Platform is then moved until clearance is visible between the blades and their respective slots. The blades are then raised above the cell to allow for placement of the test sample.

Before carrying out the test using a 'Zero' trigger one must calibrate the blades to acknowledge the bottom of the cell as a zero position. To do this, lower the blades, so that they close to the bottom of the cell. Click on **CALIBRATE HEIGHT**. Specify the distance that you want the blades to start from for each test - e.g. **42mm** is suggested. (Note: place a piece of thin flat card in the bottom of the cell to calibrate and then remove this before testing.)

The blades will move down and touch the card and then move up to the specified start distance. For the comparison of results it is crucial that the test always begins at the same distance from the bottom of the cell, this distance can be programmed into the **CONTROL PROBE** feature.

Prior to each test ensure that there is good clearance around the blades to avoid frictional effects, i.e. so that the blades are not touching the sides of the cell. The blades are then raised above the cell to allow for placement of the test sample. Running a spatula (or other) horizontally across the outside edges of the blades is recommended to ensure that the blades are hanging freely. Place the sample into the cell, distribute pieces evenly and run the test. In between tests clean the blades and the grooves of the cell to remove any remaining sample, as this will cause variable results.

Typical plots:



The left curve was produced by testing processed ham samples (40 x 40 x 70mm) at 5C.

Observations:
After the trigger force is attained on the sample surface the blades then proceed to shear through the samples. As penetration depth increases the force is also seen to increase up to the specified compression distance (i.e. 40mm). At this point the maximum force value is measured and related to the firmness/toughness of the sample. Calculating the area under the curve can also be indication of the hardness/firmness. In some cases where the sample is not very homogenous the area is more repeatable than the maximum force.

The results shows that the formed ham required a larger force to shear compared to the preformed 'mainly chunks' ham. This is probably due to the loss of meat integrity of the preformed sample and indicates that the force to shear through the meat fibers of the formed sample is greater than to shear and separate a sample consisting of bound together meat chunks.

Data Analysis:
☒Max Force

Results

Sample	Mean Max. Force 'Maximum Shear Force' (+/- S.D.) (N)
Formed Ham	297.4 +/- 21.9
Preformed Ham	225.6 +/- 15.8

Notes:
- The Kramer shear cell is a multi-bladed device. The sample to be sheared is often variable configuration or structure. The result is an average of the forces required to cut through the sample of variable geometry.
- If the sample is more firm/tough or it is preferable to shear to a greater extent, a 100kg load cell would be recommended for a higher force range.
- When attempting to optimize test settings it is suggested that the first tests are performed on the hardest samples to anticipate the maximum testing range required and ensure that the force capacity allows testing of all future samples.