Application manual No. 121

Production: SURIMI

Objective: Comparison of the firmness of different types of surimi using a spherical probe

Type of action: Penetration test

Test mode settings:

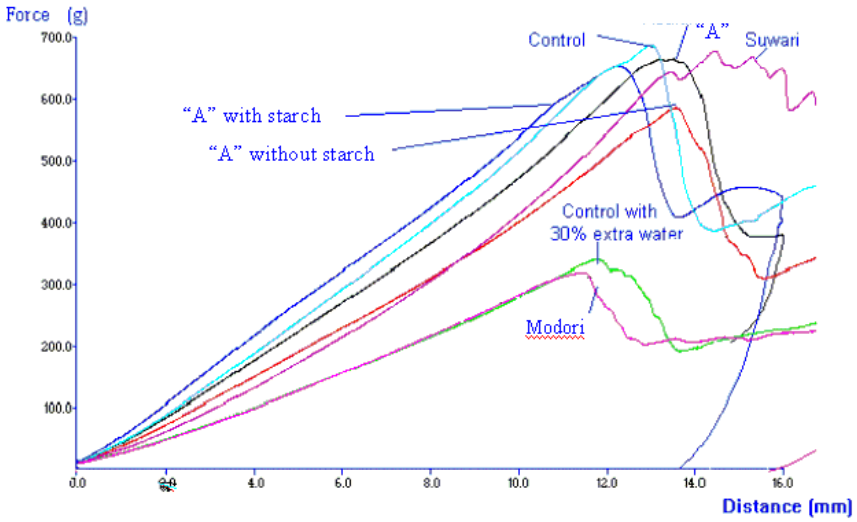
Speed	Test mode	Trigger	Target	Hold
1.1mm/s	Distance (c)	10 gf	15 mm	0 sec

Accessory:
ϕ5 mm spherical probe, Platform

Sample Preparation:
Cut the surimi samples into cylinders of constant dimensions e.g. 32mm diameter, 25mm height. Remove samples from storage just prior testing.

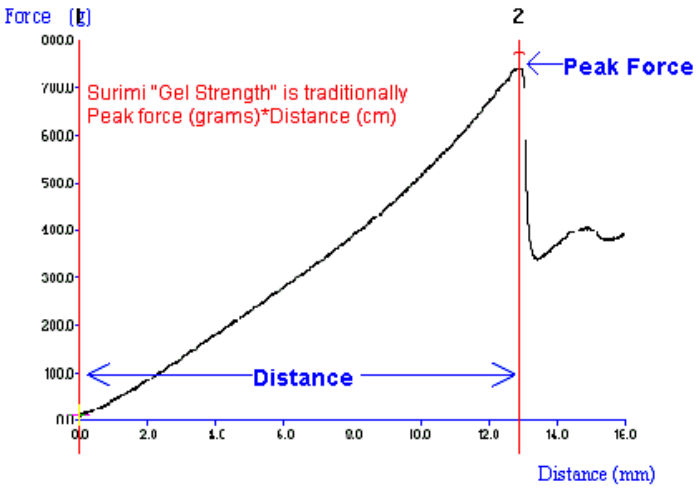
Test Set-Up:
Position the sample diametrically under the probe and commence the penetration test.

Typical plots:



The left curves were produced from surimi samples of different formulations, tested at 5C.

Observations:
Once the trigger force of 10g is attained the probe proceeds to penetrate the sample to a distance of 15mm. The force to puncture into the surimi (breaking force) and the distance at which the ball probe punctured into the surimi (breaking distance) are both important values. Traditional surimi is measured according to three parameters, maximum force (breaking force), distance to rupture, and "gel strength". "Gel strength" is the peak force in grams, multiplied by the distance to the rupture event measured in centimeters and is equivalent to the Japanese gel strength measurement (Yamazawa, 1990). The resulting value has a unit of gram-centimeters.



The results show differences in gel strength for the samples which were tested by the penetration method. A high gel strength value, e.g. 1019g.cm for "A" grade surimi indicates a surimi of much higher degree of firmness compared to its "A" grade counterparts which highlights the effect of addition of ingredients to the product. The very high gel strength of suwari and the very low gel strength of modori, when compared to the control surimi sample, highlights the effect of processing time and temperature on the gel consistency of surimi.

Data Analysis:

☒Max Force

☒Peak Distance

☒Gel strength

Results

Sample	"Gel Strength" (g.cm)
Control	958 +/- 9.6
Control with 30% water	461 +/- 10.2
A grade	1019 +/- 25.7
A grade with starch	865 +/- 35.3
A grade without starch	884 +/- 38.0
Modori	407 +/- 13.5
Suwari	1363 +/- 45.7

Notes:

- The results of the above and the other test methods described are of important consideration when manufacturing a surimi product which is perceived with certain textural characteristics or developing new surimi-based products with different requirements for the desired finished product quality. Gel forming ability of frozen surimi is the most important functional requirement imposing good quality on surimi-based products.
- 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.