ISO 9001 CERTIFIED
BROOKFIELD AMETEK

TEXTURE ANALYSIS APPLICATION NOTE:

Moisturizing Cream

Firmness Test

TEST PRINCIPLE

Evaluation of the consistencies of two types of moisturizing creams by penetration using a hemispherical probe.

BACKGROUND

Moisturizing creams serve to keep the skin feeling smooth, soft, and looking radiant and healthy by retaining moisture or water in the outer most skin layer. Different moisturizing creams will be defined by their consistency. Formulating moisturizing creams therefore largely depends upon the required end product consistency, influencing the choice of material to use.

The penetration test, using a hemispherical probe, is an imitative test simulating the ease by which a human finger will deform the sample during application of the cream. This test allows the consistencies of creams to be assessed. Samples can also be tested in their containers directly from the production line.

METHOD

EQUIPMENT: CT3 with 4.5kg load cell
Fixture Base Table (TA-BT-KIT)
Hemispherical probe (TA-43)

SETTINGS:		
	Test Type:	Compression
	Pre-Test Speed:	1.0 mm/s
	Test Speed:	2.0 mm/s
	Post-Test Speed:	2.0 mm/s
	Target Type:	Distance
	Target Value:	25 mm
	Trigger Force:	10 g

Note: It is recommended that the pre-test speed be the same as or less than the test speed for accurate trigger detection; for example, 1 mm/s test speed will require ≤ 1 mm/s pre-test speed.

The target distance chosen should be such that the probe does not deform the sample to more than 75% of sample depth, otherwise the base effect may affect results.

PROCEDURE

1. Attach the hemispherical probe to the load cell.
2. Align the sample centrally under the probe.
3. Start the test.
4. When the probe is pulling out of the sample and returning to the start position, firmly hold the sample down to prevent it from lifting.
5. Ensure thorough wiping of the probe using a clean, dry cloth to remove all traces of adhering soap before proceeding onto the next test.

Note: When optimizing test settings, the hardest sample would be better tested first in order to anticipate the maximum testing range required. This will ensure that the force capacity covers the range for other future samples.

The penetration test can also indicate whether there are trapped air bubbles or a grainy texture, seen as fluctuations in force, as the probe comes into contact with air bubbles or hard particles.

RESULTS

The following is a typical Texture Analysis penetration plot of two different types of moisturizing cream.

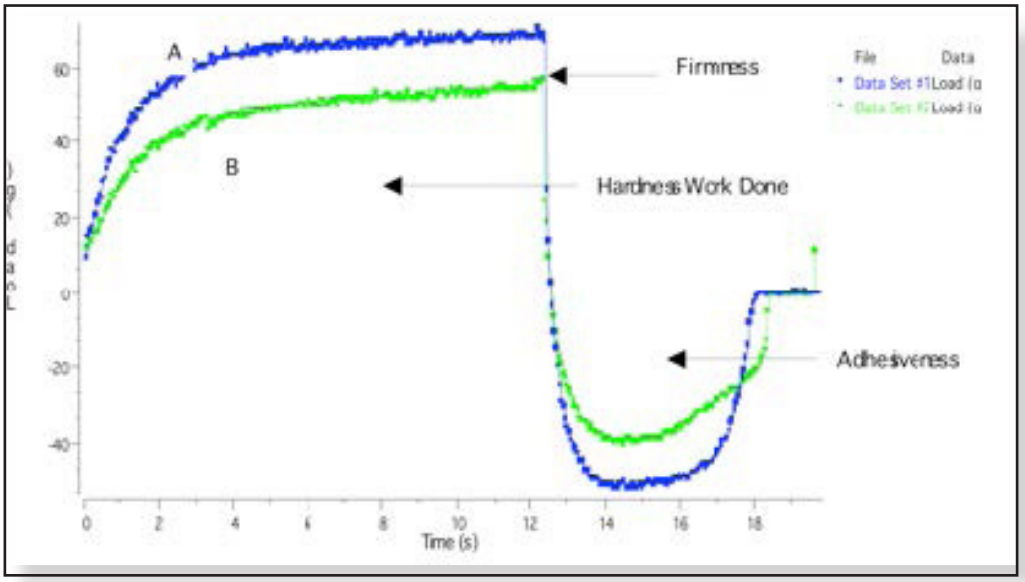

Figure I

Figure I compares the hardness of two different moisturizing cream formulations tested at 21°C.

Data Set #1: Sample A (Premium Moisturizing Cream)
Data Set #2: Sample B (Budget Moisturizing Cream)

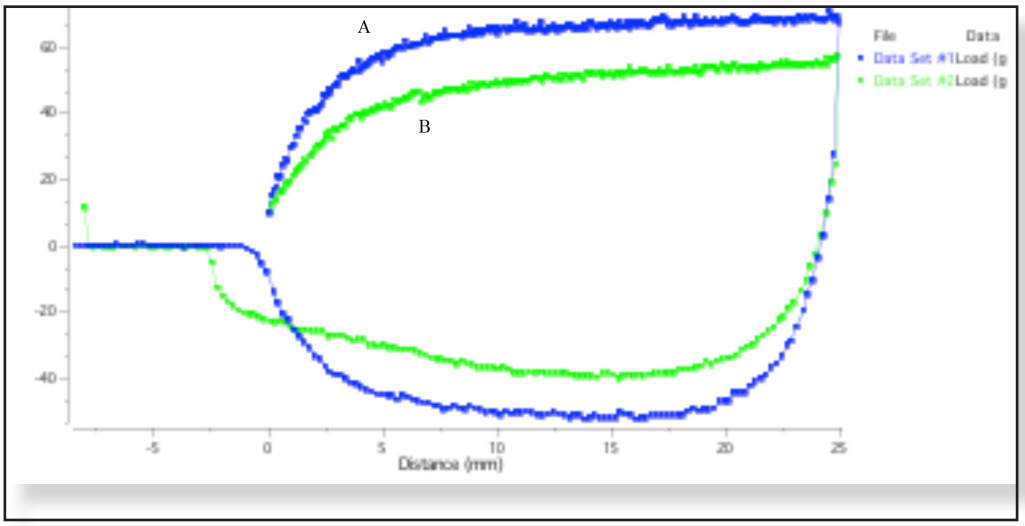

Figure II

Figure II displays a graph of load versus distance comparing the hardness of two different moisturizing cream formulations.

Data Set #1: Sample A (Premium Moisturizing Cream)
Data Set #2: Sample B (Budget Moisturizing Cream)

OBSERVATIONS

When a trigger force of 10 g is achieved, the probe begins to penetrate the sample to a defined distance (25 mm in this case). The maximum positive force then becomes force value, the firmer the sample. From Figure I, sample A is firmer than sample B and is also more adhesive. The energy required to deform the samples can be quantified by selecting Work Done Hardness 1 in the software. This is the area under the positive curve. As can be seen in the table below, Sample A requires more energy than sample B to deform the sample to a defined deformation distance.

Table I

Sample	Hardness (g)	Hardness Work Done (mJ)
A	70.5	14.91
B	57.1	11.38

The adhesiveness of the samples can also be measured whereby the area under the negative curve is a measure of adhesiveness. From Figure I, Sample A is more adhesive than Sample B.