

TEST PRINCIPLE

Compare the consistencies of two types of shampoo (premium and budget shampoo) by forward and backward extrusion.

BACKGROUND

Formulating shampoos largely depends upon the required end product consistency, therefore influencing the choice of material to use. Shampoos generally contain 70-80% water, detergent, and preservatives. Most shampoos also include oils, sulphates, and alkanolamides to improve texture and foaming ability of the shampoo, as well as other chemicals to improve shine and condition the hair.



Shampoos can be tested at various times in development and in the production process for sample texture amongst other factors. One desirable factor in product development is having a product that easily squeezes out of a tube, leaving minimal residues on the rim of the tube after squeezing. Achieving such a product requires good sample thickness (viscosity) that produces the desired consistency.

With the use of forward and backward extrusion tests, sample consistencies can be assessed. The forward extrusion simulates the force required by the consumer to extrude the sample and the backward extrusion an indication of product physical failure and flow properties.

METHOD

EQUIPMENT: CT3 with 4.5kg load cell
Fixture Base Table (TA-BT-KIT)
Dual Extrusion Cell (TA-DEC)

MATERIALS: Dual extrusion cell 40 mm diameter, with blank plate
Plunger with 38 mm diameter disc or smaller

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 Value:	25 mm
Trigger Force:	30 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, 2 mm/s test speed will require ≤ 2 mm/s pre-test speed.

The target distance chosen should be such that the probe does not touch the base container, otherwise the instrument will be overloaded (do not exceed 75% of sample depth).

PROCEDURE

1. Remove the sample kept at a specific temperature (E.g., 21°C) from storage.
2. Fill the extrusion cell with the sample to about 75% full.
3. Position the extrusion plunger centrally over the extrusion cell.
4. Commence the test.

RESULTS

A comparison of consistencies of two types of shampoo by forward and backward extrusion:

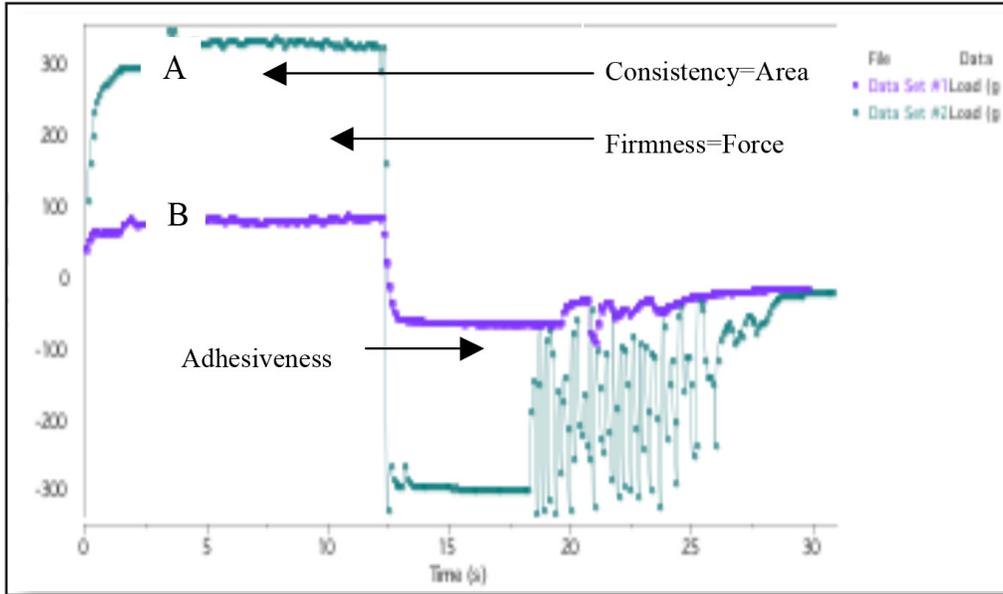


Figure I

Figure I is a loaded versus time graph showing the consistencies of two types of shampoo stored and tested at 21°C in a 40 mm diameter extrusion container.

Data Set #1: Sample A (Premium Shampoo)

Data Set #2: Sample B (Budget Shampoo)

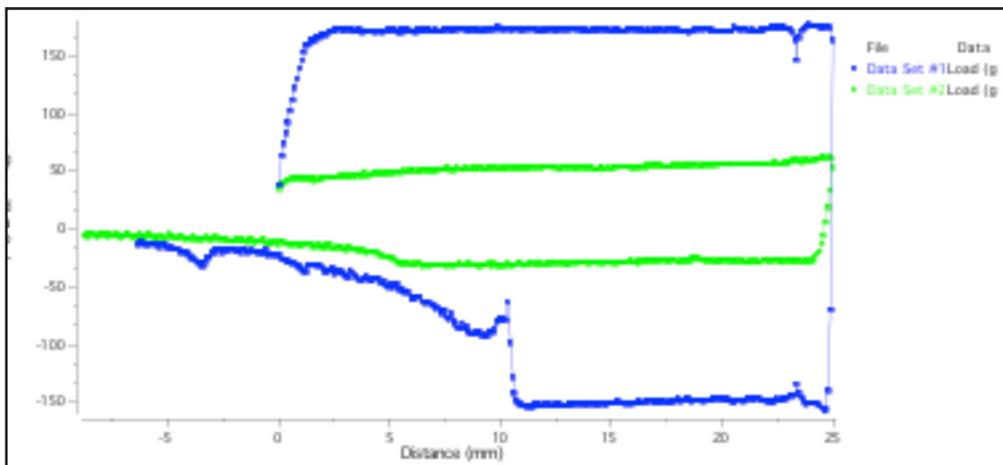


Figure II

Figure II is a load versus distance graph showing the consistencies of two types of shampoo.

Data Set #1: Sample A (Premium Shampoo)

Data Set #2: Sample B (Budget Shampoo)

OBSERVATIONS

When a trigger force of 10 g has been achieved, the disc plunger begins to penetrate to a specified distance (25mm) after which the probe returns to its starting position. The maximum force during probe descent, represented as a peak on the graph, measures firmness; the higher the value, the firmer the sample. The area under the positive part of the graph indicates sample consistency (work done to hardness¹); the higher the value, the thicker and the higher the consistency of the sample. As the probe returns to its starting position, the initial lifting of the weight of the sample on the upper surface of the disc produces the negative part of the graph resulting from back extrusion. This gives an indication of the cohesiveness and resistance of the sample to separate (flow off) from the disc. The maximum negative force on the graph indicates sample adhesive force; the more negative the value, the more “sticky” the sample.

The area under the negative part of the graph is known as the adhesiveness (The energy required to break probe sample contact) and can give an indication of the cohesive forces of the molecules within the sample. The higher the value, the more energy required to break the probe sample contact as the probe withdraws from sample. From Figure 1, sample A is more firm and has a higher consistency than sample B. Also sample A has a higher adhesive component than sample B.