

Hard Round Tablet Crush Test

Understanding the hardness and fracturability of hard, round tablets is crucial for ensuring product quality. Tablet hardness affects dissolution rates, friability, and handling during packaging. This analysis helps manufacturers evaluate the mechanical strength of tablets, ensuring they are durable but easy to break down for consumption.

Test Objective:

- To measure the hardness, work done, and fracturability of hard, round tablets (Figure 1) using a compression test with a 36 mm diameter flat cylindrical probe (TA-AACC36) on a CTX Texture Analyzer.

Equipment:

- Instrument: CTX Texture Analyzer with a 50 kg Load Cell (Figure 2)
- Probe: 36 mm Flat Cylindrical Probe (TA-AACC36) (Figure 3)
- Fixture: Fixture Base Table (TA-BT-KIT)
- Software: Texture Pro

Settings:

- Test Type: Compression
- Target Distance: 2 mm
- Trigger Load: 30 g
- Test Speed: 1 mm/s

Procedure:

1. Attach the TA-AACC36 probe to the CTX Texture Analyzer.
2. Align the sample on its side between the probe and the Fixture Base Table (Figure 4).
3. Set the test parameters in the TexturePro software.
4. Start the test, compressing the tablet at 1 mm/s until reaching the 2 mm distance.
5. Record the peak load (firmness) and the work done.



Figure 1 - Hard, Round Tablet



Figure 2 -

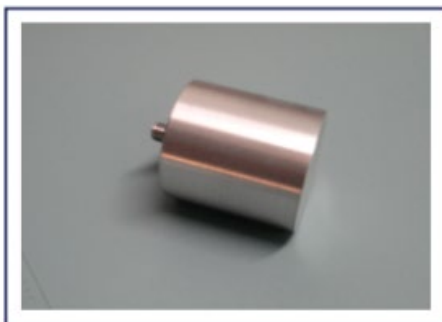


Figure 3 -
36 mm Diameter
Flat Cylindrical Probe (TA-AACC36)



Figure 4

Observations:

- Figure 5: The probe compresses the tablet, and the Load vs. Time graph (Figure 6) shows the peak load, which represents tablet hardness. The Load vs. Distance graph (Figure 7) shows the work done and the point where the tablet breaks.
- Peak Load indicates the force required to crush the tablet.
- Work Done reflects the energy necessary to compress the tablet before fracture.
- The first fracture point shows the tablet's brittleness.



Figure 5

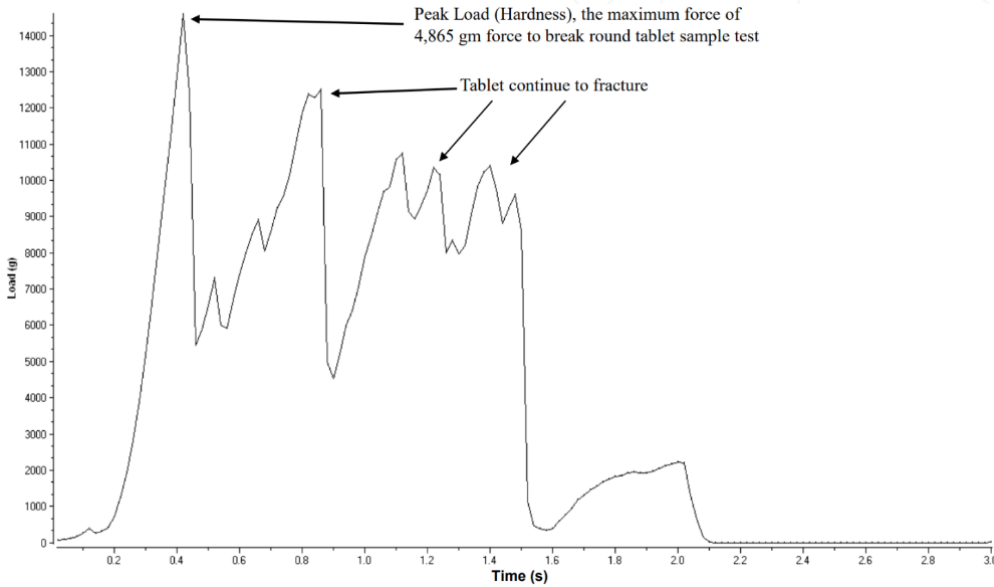


Figure 6

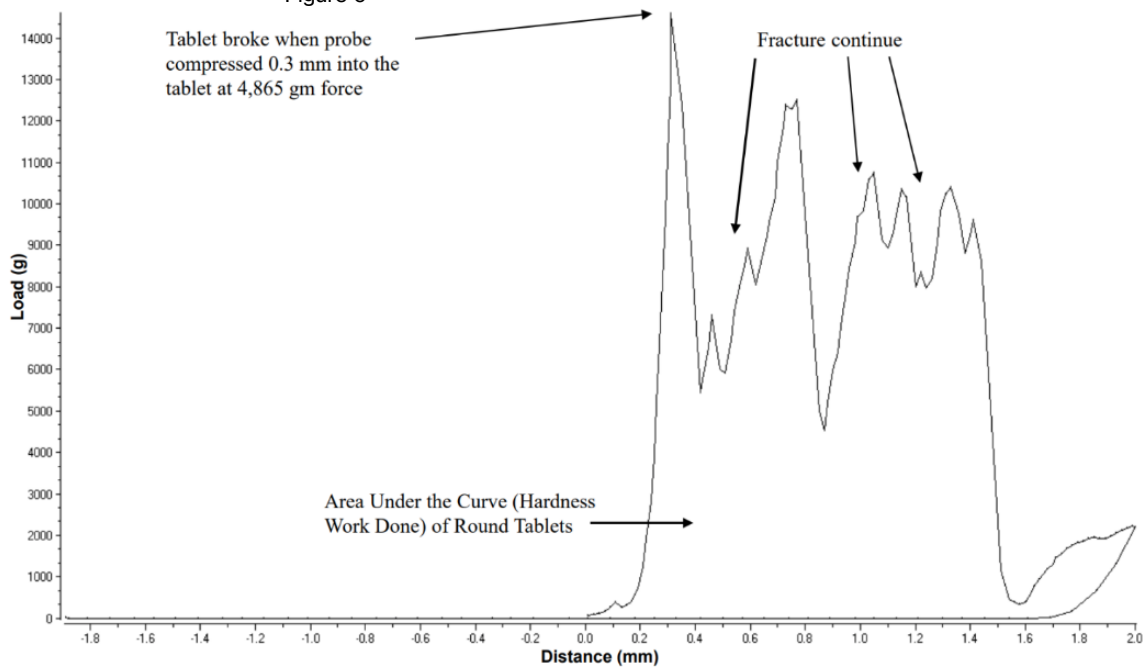


Figure 7

Results:

- Peak Load (Firmness): 4865 g (measured when the tablet broke after 0.3 mm compression).
- Fracturability: Measured based on the quantity of fractures during the first compression stroke.
- Work Done: Area under the curve in the Load vs. Distance graph, representing the energy needed to break the tablet.

#	Sample Description		Result	Hardness Cycle 1	Hardness Work Cycle 1	Quantity of Fractures	Fracturability
	Product Name	Batch Name	Sample	g	mJ		g
1	Acetaminophen	Round Tablet	1	14865.00	85.00	5.00	14865.00
2	Acetaminophen	Round Tablet	2	15265.00	18.50	1.00	13525.00
3	Acetaminophen	Round Tablet	3	15345.00	83.10	3.00	13600.00
4	Acetaminophen	Round Tablet	4	13295.00	29.80	2.00	13295.00
5	Acetaminophen	Round Tablet	5	14585.00	115.20	9.00	12880.00
Calculation Setting			Minimum	13295.00	18.50	1.00	12880.00
Fracture Sensitivity: 1% of Load			Maximum	15345.00	115.20	9.00	14865.00
			Average	14671.00	66.30	4.00	13633.00
			Standard Deviation	828.00	40.70	3.00	744.00

Conclusion:

The hardness and fracturability of tablets are critical for ensuring they withstand handling while being easy to consume. This analysis provides key data for optimizing tablet formulations. Accurate sample preparation and test setup are essential for reproducible results.