(800) 628-8139 or (508) 946-6200
brookfieldengineering.com

Tomato Ketchup Viscosity Analysis

Understanding the viscosity of tomato ketchup is essential for maintaining product quality, texture, and consumer experience. Viscosity affects pourability, spreadability, and the sensory perception of the product. This analysis helps ensure that ketchup flows consistently from the bottle while maintaining the desired thickness and mouthfeel.

Test Objective:
To compare the viscosity of three tomato ketchup brands using LV and RV viscometers, assessing their flow characteristics and consistency under different shear rates.

Figure 1

Method I: LV Viscometer

Equipment:

- Instrument: AMETEK Brookfield DVNext LV Viscometer (Figure 3)
- Spring Torque Range: LV
- Spindle: LV-4 (64)
- Speeds: 5, 10, 15, 20 RPM
- Software: RheocalcT for automated control and data acquisition

Figure 2

Procedure:

1. A 500 mL ketchup sample was poured into a tall form beaker and stabilized at 25°C for 30 minutes.

2. Viscosity was measured at four different speeds using the LV-4 spindle, recording results at each speed.

Observations (Method I):

Figure 4: Displays the spindle setup for viscosity measurement.

Figure 5: Shows the viscosity values decreasing as speed increases, indicating a shear-thinning behavior. Higher viscosity at lower speeds is seen across all brands.

Figure 3

Viscosity Results:

- Maggi: Highest viscosity at low shear rates, indicating thicker texture.
- Kissan and Heinz: Showed similar trends with moderate viscosity across all speeds.

(800) 628-8139 or (508) 946-6200
brookfieldengineering.com

Speed (RPM)	Maggi		Kissan		Heinz	
	Viscosity (cP)	Torque (%)	Viscosity (cP)	Torque (%)	Viscosity (cP)	Torque (%)
5	29520	24.6	24960	20.8	26640	22.2
10	16620	27.7	13200	22.0	15000	25.0
15	12440	31.1	9680	24.2	10720	26.8
20	10080	33.6	8250	27.5	8490	28.3

Figure 4

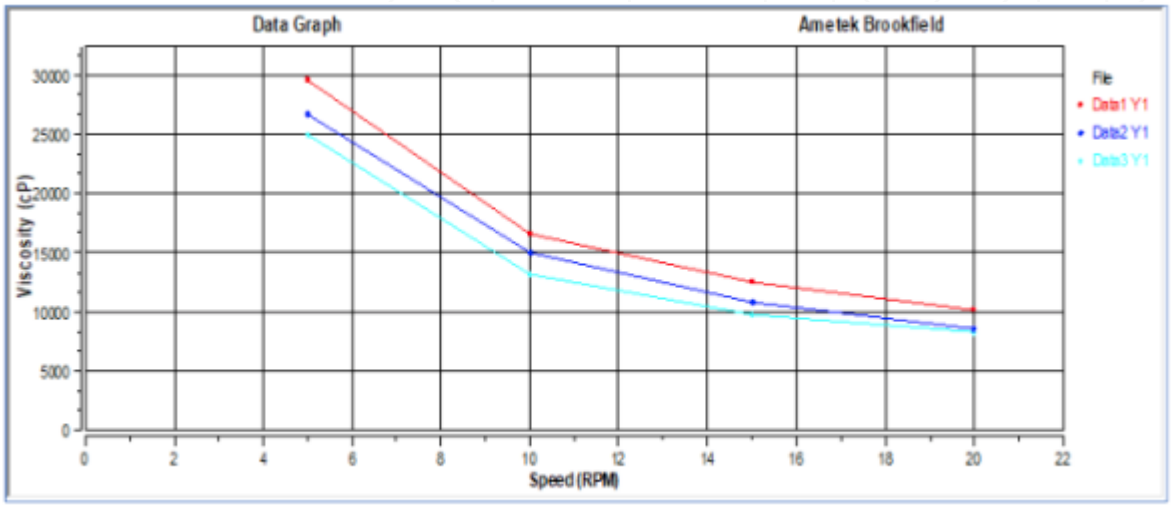

Figure 5

Method II: RV Viscometer

Equipment:

- Instrument: AMETEK Brookfield DV2T RV Touch Screen Viscometer (Figure 6)
- Spring Torque Range: RV
- Spindle: RV-4 (4)
- Speeds: 10, 20, 30, 40 RPM
- Software: RheocalcT for data acquisition

Figure 6

Procedure:

1. The same 500 mL sample from Method I was used, stabilized at 25°C.
2. Viscosity was measured across the specified speed range.

(800) 628-8139 or (508) 946-6200
brookfieldengineering.com

Observations (Method II):

Figure 7: Shows the RV spindle setup.

Speed (RPM)	Maggi		Kissan		Heinz	
	Viscosity (cP)	Torque (%)	Viscosity (cP)	Torque (%)	Viscosity (cP)	Torque (%)
10	13620	68.1	10900	54.5	11480	57.4
20	7670	76.7	6230	62.3	6330	63.3
30	5587	83.8	4467	67.0	4507	67.6
40	4360	87.2	3470	69.4	3555	71.1

Figure 7

Figure 8: Displays the viscosity decreasing as speed increases, confirming the shear-thinning nature of the ketchup. As shear rate increases, viscosity decreases, allowing ketchup to flow more easily.

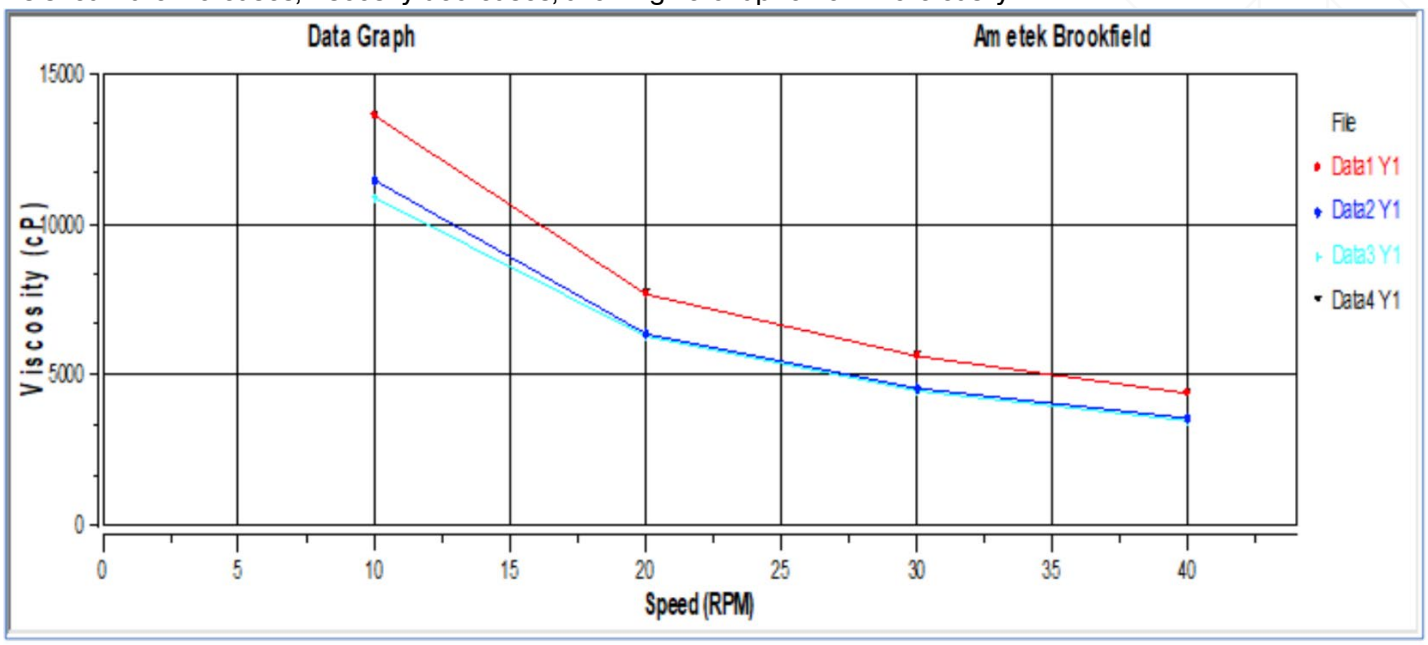

Figure 8 - Graph of Viscosity v/s Speed (RPM)

Viscosity Results:

All brands exhibited similar trends, with decreasing viscosity as shear rates increased, characteristic of pseudoplastic fluids such as ketchup.

Conclusion:

The viscosity results demonstrate that ketchup is a non-Newtonian, shear-thinning fluid. The ability to flow more easily when force is applied (such as squeezing the bottle) and return to its original thickness when the force is removed is essential for consumer convenience. This analysis helps manufacturers ensure consistent product performance across different brands.