Quality Control of Dishwashing Detergents

Analyzing the viscosity of liquid dishwashers at different speeds shows you how the detergent behaves during e.g. squeezing it out of the bottle. This application report can offer you a brief insight on typical measurements with the ViscoQC™ 100.

1 Introduction

A rotational viscometer like the ViscoQC™ 100 is commonly used for the quality control of detergents. The viscosity of the detergent has influence of its flow behavior.

A well performing hand dishwasher should provide convenient dispersing and adequate aesthetic appeal to satisfy the user. For automated dosage systems of dishwashers, proper pumpability of the detergent with water is important.

Quick single point viscosity checks at one or at different speeds to study the shear thinning behavior of detergents are possible with ViscoQC™ 100. Shear thinning means that the viscosity decreases by increasing the speed.

1.1 Keywords

Detergent, dishwasher, chemical industry, rotational viscometer, viscometer, viscosity, viscosity quality control, dynamic viscosity, ISO 2555

2 Experiment

Instrument: ViscoQC™ 100 - L
Spindle: L2
Guard: L
Speed: 12 rpm, 20 rpm, 30 rpm, 40 rpm, 50 rpm
Temperature: 23 °C
Sample: Liquid hand dishwashing agent

All measurements were performed with ViscoQC™ 100 - L rotational viscometer from Anton Paar GmbH according to *ISO 2555*.
ViscoQC™ 100 - L is suited for a viscosity range of 1 to 6 000 000 mPa.s.

ISO 2555 is a standard test method for testing resins in liquid state or as emulsions or dispersions by a rotational (spindle-type) viscometer. This standard can also be applied for other non-Newtonian liquids such as the kind of measured substance.

2.1 Test Procedure

- 500 mL of the sample was filled in a 600 mL beaker.
- After manually stirring the sample for 5 minutes with a rod, the tests were started.
- Before taking viscosity readings, the spindle turned at slow speed for approx. 5 minutes in the sample to improve thermal equilibration.
- The viscometer was set at the rotational speed of 12 rpm (translates to 21 % torque).
- The dynamic viscosity reading was taken after 60 seconds. The ViscoQC™ 100 gives a direct reading of the dynamic viscosity in mPa.s.
- The speed was increased step-wise (12 rpm, 20 rpm, 30 rpm, 40 rpm, 50 rpm) and the dynamic viscosity reading was taken after 60 sec. Between the measuring points, the sample rested for 30 seconds.
- The measurement was stopped in between changing the speeds to automatically create a data point in V-Collect Software.
- After viscosity determination at the maximum speed, the speed was decreased in steps to the slowest speed.

3 Results and Discussion

The results are shown in Figure 1. It shows the change of dynamic viscosity (red) and torque % (green points) over speed rate.

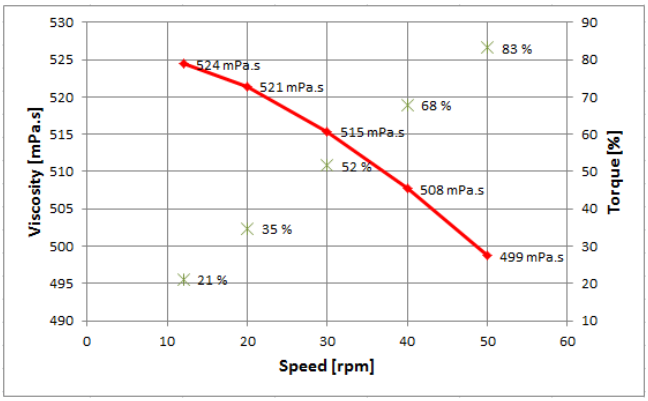

Figure 1: Viscosity of detergent at certain speeds

4 Summary

The viscosity of the detergent decreases by increasing the speed. This type of flow behavior is referred to as “shear thinning”. It is a common behavior of such a substance. The viscosity of a dishwashing agent at a certain speed serves information about its quality.

5 Accessories

For this application several accessories for the ViscoQC™ 100 were used:

Pt100 sensor:	For monitoring the temperature
Flexible cup holder:	To exactly center the sample container (600 mL beaker, pint, ½ pint or quart). A different position of the sample vessel is a big risk for erroneous measuring results.
V-Collect Software:	Connect ViscoQC™ to a PC with USB interface and export the measurement results directly to the data collection software V-Collect.

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