Measurement of Dough with the Rotational Rheometer RheolabQC

Rheological properties of dough play an essential role in the production and baking process of all kinds of baked food products. This report shows example measurements on different kinds of dough and describes which instrument configuration of the RheolabQC is best suited for such measurements.

1 Introduction

Knowledge of the viscosity of dough is essential for the manufacturing and production process as well as for quality control of the final product. To predict the final product quality good knowledge of the dough properties is necessary. With the RheolabQC it is possible to simulate the behavior at rest (low rotational speed) and under transporting/stirring conditions (high rotational speed).

2 Experimental Setup

All measurements shown here were performed with an Anton Paar RheolabQC equipped with the Peltier temperature device C-PTD 180/AIR/QC.

The rheometer measures the viscosity of the sample by measurement of rotational torque and speed.

The Peltier temperature device C-PTD 180/AIR/QC ensures a homogenous temperature distribution in the sample and can be used in a temperature range from 0 °C to +180 °C for quick and accurate temperature control. It is air-counter cooled and does not require any thermal transfer liquids. The temperature of the measuring system can be controlled manually directly on the rheometer or by using the Anton Paar rheometer software. The heating rate can be chosen with the software.

Figure 1: The Anton Paar RheolabQC Portfolio

The RheolabQC can be equipped with different types of measuring geometries. For dough we recommend:

- **Standard cylinder systems**

  B-CC10, B-CC17 or B-CC27: Standard concentric cylinder bobs. When the corresponding cups are used the measurements accord to ISO 3219. Alternatively, the bobs can be used with bigger cups (CC27 or CC39) for easier filling and handling.

Tip: ISO 3219 describes the construction of the cylinder geometry and defines the ratio of measuring cup diameter to measuring bob diameter as 1.0847. This guarantees an industrial standard for shearing the sample homogeneously in the measuring gap, independent of the measuring system size and manufacturer.

- **Sandblasted cylinder systems**

  B-CC10/S, B-CC17/S or B-CC27/S: Sandblasted concentric cylinder bobs are used to avoid slipping effects for samples containing a high fat content.

- **Stirrers**

  Stirrers can be used if it is important that the dough is well mixed during the measurement. The recommended stirrer for medium viscosity dough is St24 (Figure 2).

- **Ball measuring system**

  If the dough contains bigger particles, grains or nuts, the unique ball measuring system for the RheolabQC can be used.

3 Results and Discussion

A butter biscuit and bread dough were measured. The butter biscuit dough was prepared with flour, sugar, butter and eggs. For the bread dough a bread baking mix was mixed with water.

Figure 2: Biscuit dough (left); bread dough (right)

Both doughs were measured at different rotational speeds at a constant temperature of 23 °C. Both doughs show a shear thinning behavior and can be well measured on the RheolabQC. As expected from the consistency of the dough the biscuit dough shows higher viscosity values than the bread dough over the whole measured range (Figure 3).

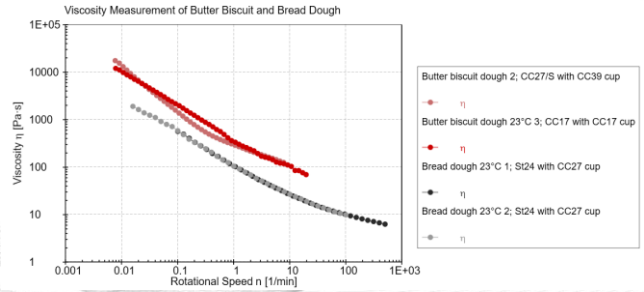

Figure 3: Viscosity Curve

4 Did You Know?

Dough measurements on rheometers have a long tradition. Did you know that the first rheometers were developed for that kind of application? In 1927 Hankoczy constructed a dough kneader operating at a constant rotational speed, measuring the flow resistance by way of torque values. In 1930 C.W. Brabender constructed dough kneaders, termed „Amylograph“, „Farinograph“ and „Extensograph“ based on Hankoczy‘s prototypes.

5 Summary

Continuous quality control is essential in order to achieve consistently high quality despite of the immense production volume. The dough viscosity of baked goods is a particularly important parameter.

The RheolabQC with the unique air-cooled Peltier temperature device C-PTD 180/AIR/QC is perfectly suited to determine the viscosity of all kinds of dough. The speed (respectively the shear rate) or the shear stress can be preset and the viscosity measured. Time- and temperature-dependent measurements at constant shear rates can easily be performed. RheolabQC can be operated with a huge variety of measuring systems. The automatic measuring system recognition Toolmaster™ ensures error free viscosity determination.

For food manufacturers that are not only interested in the quality control of the final product but also in processing properties and research and development of new products, the RheolabQC with its high precision encoder and a highly dynamic EC motor offers a much wider application range than conventional spring type viscometers with their limited torque and speed range.

If you have further questions regarding this application report please contact your local Anton Paar representative.

Contact Anton Paar GmbH

Tel: +43 316 257-0

support-visco@anton-paar.com| www.anton-paar.com