Foam Rise Height and Pressure Measurement in Narrow Containers

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- High resolution rise height and rise pressure measurements of small foam samples
- Objective and reproducible cream time, rise time and gel time determination

The classical method of characterizing foams is to measure their rise profile. The expansion of a foam sample is measured in a cup, a box, or a cylinder, typically by using ultrasonic distance sensors.

Sealing foams or microcellular foams are usually tested in small cups. For machine tests even disposable shot glasses are common. Due to the small inlet opening of these test containers, standard ultrasonic distance sensors cannot be used, as they receive an echo from the edge of the cup. To overcome this, Format Messtechnik GmbH has introduced a new **S**ound **C**entering **B**low **T**ube **SCBT** for their proofed ultrasonic fan sensor LR 4 (Fig. 1). The LR 4 is part of the Foam Qualification System FOAMAT® 285.

The SCBT reduces the ultrasonic beam to its central part, so that it can measure into the small opening of a test container without being reflected at the edge of the opening. This part of the ultrasonic lobe is then reflected by the foam surface and is detected by the ultrasonic sensor. The distance from the foam surface or the height of the foam can be determined precisely from the travel time of the echo and the velocity of sound (Fig. 2).

Using SCBT, the ultrasonic fan sensor LR 4 can also be combined with the Foam Pressure Measurement device FPM 50 (Fig. 4). With an inner diameter of 50 mm only, it is the perfect rise pressure measurement device for small foam samples. The rise pressure (Fig. 3) reveals important information about the gel time and the tensioning of the foam. Connected to the Foam Qualification System FOAMAT 285 the rise pressure can be recorded simultaneously with the rise height and the core temperature.

Additionally, a laser distance sensor **SL 1** can be integrated into the Foam Qualification System FOAMAT 285. The SL 1 can measure foam rise height in narrow molds. It can also measure thermally expanding foam samples at high mold temperatures (Fig. 5).

In summary, the SCBT and the laser distance sensor SL 1 offer a solution for measuring rise profiles of foaming samples in small test containers. The new measurement technology, in combination with the pressure measurement device FPM 50 can be used in laboratory for the development of new formulations as well as in quality and production control testing.

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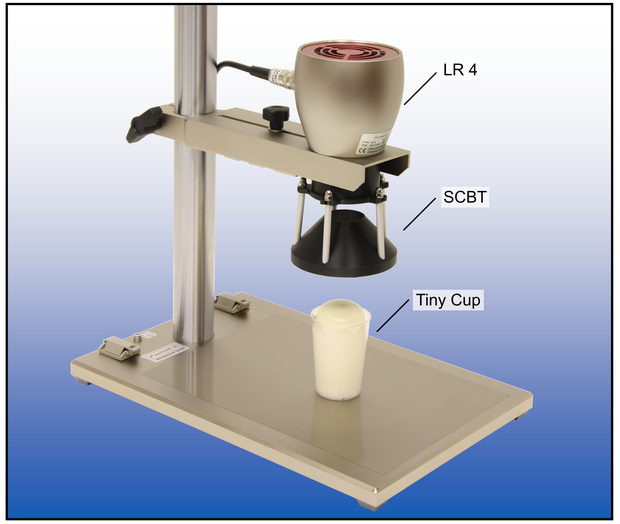

Fig. 1: The ultrasonic fan sensor **LR 4** with the new **S**ound **C**entering **B**low **T**ube **SCBT** is especially designed for measuring the distance to the foam bun in tiny test cups. The LR 4 is part of the FOAMAT® 285 system.

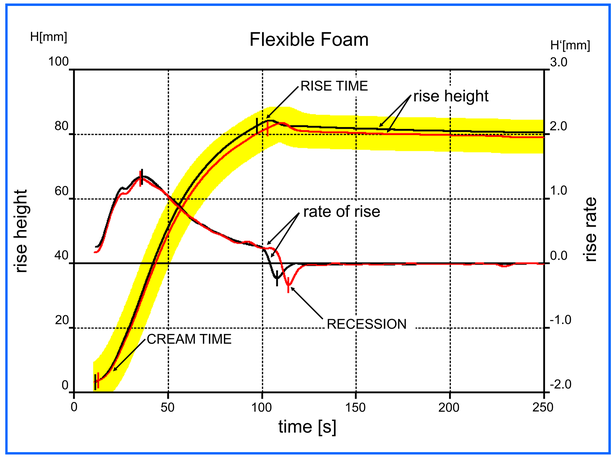

Fig. 2: Reproducibility measurements of a flexible polyurethane foam expanding in a tiny test cup. The yellow band is a master curve of the rise height. The CREAM TIME and RISE TIME are determined by height criteria.

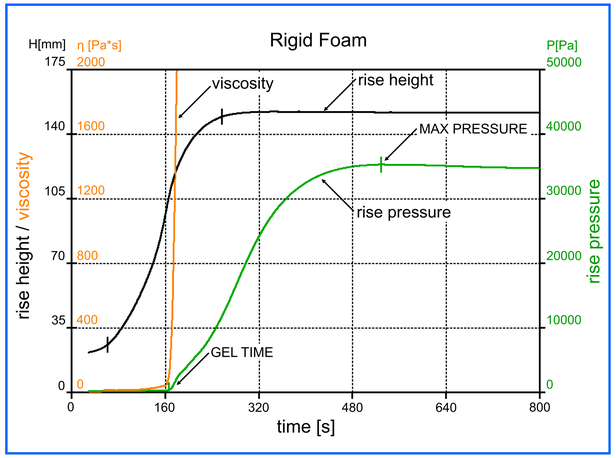

Fig. 3: Rise height and rise pressure of a rigid polyurethane foam, measured with the ultrasonic fan sensor LR 4 and the Foam Pressure Measurement device FPM 50. The viscosity is calculated according to the Hagen-Poisseuille's equation.

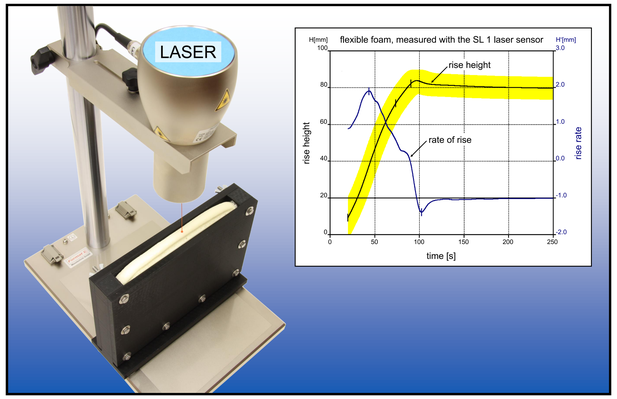

Fig. 5: The new laser sensor **SL 1** measures the rise height in a narrow mold. The measurement is also possible at high mold temperatures.

Fig. 4: The proofed ultrasonic fan sensor **LR 4** with **SCBT** can be combined with the Foam Pressure Measurement device **FPM 50**. This enables simultaneous rise height and pressure measurement.