

Messtechnik GmbH

- Creep behavior of PU and PIR foams in long cardboard cylinders
- resolution rise height and High pressure measurements
- No pouring of the mixture into the test container

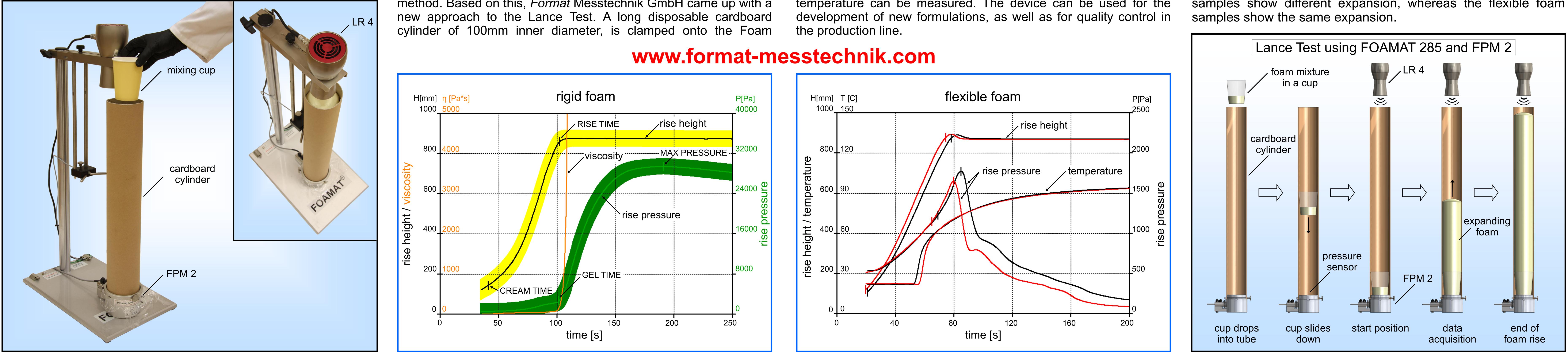


Fig. 2: Lance Test with a rigid PU foam formulation. The rise Fig. 1: Lance Test setup: A long cardboard cylinder, is clamped pressure is measured via the FPM 2 pressure plate. The onto the Foam Pressure Measurement device FPM 2 which is viscosity is calculated according to Hagen-Poisseuille's equation. connected to the Foam Qualification System **FOAMAT**. The foam The colored areas are acceptable margins. mixture including the mixing cup is dropped into the cylinder.

A New Approach for Lance Test of PU and PIR Formulations

In the production of large PU and PIR parts, e.g. refrigerators, Pressure Measurement device FPM 2 (Fig. 1). The mixing cup diameter is just slightly smaller than the inner diameter of the panels, insulated pipes or construction elements, the creep cylinder. After mixing, the formulation including the cup is dropped behavior of the foaming mixture is of special importance. The into the cylinder from above (Fig. 4), with the mixing cup bottom phase of low viscosity should be long enough to allow the PU and PIR foam systems to fill the complete volume of the structure. An facing down. Due to the perfect diameter of the cup and its air friction, the mixing cup slides gradually down the cylinder and established method of testing the creep behavior of the foaming mixture is the so called "Lance Test". For this test generally a long stops on the pressure plate of the FPM 2. The FPM 2, with the metal tube is used which is coated inside with a tubular foil. The clamped cylinder, is positioned under the contactless ultrasonic distance sensor LR 4. The rise height and pressure measurement formulation is mixed in a cup, which is placed underneath or inside is initiated by a photo switch (Fig. 1). The mixture starts to expand the tube, so that the expanding foam can gradually creep into it and creeps through the cylinder (Fig. 5) towards the contactless from below. A contactless height or distance measurement is very error-prone opening time can be determined by the pressure reading. In that is pushed through the cylinder into the rising foam (Fig. 3).

ultrasonic distance sensor, which records the height of the rising flexible foam - same formulation foam. The rise pressure of the foam presses the mixing cup to the due to the tubular foil liner inside the long metal tube. Therefore a pressure plate of the FPM 2. The gel time as well as the cell float is usually placed on top of the rising foam. The float is connected to a pulley and a counterweight being moved upward by and the second of the second s addition, the reaction temperature is recorded with a thermocouple the foam bun through the tubular foil. The foam rise is detected by measuring the movement of the counterweight. An advantage of In summary, the new approach to lance testing using FOAMAT this method is that it is not necessary to pour the mixture into the 285 and FPM 2 provides a simple and precise method to record test container. There is no variation in the quantity of the tested the creep behavior of PU or PIR foam formulations in a long mixture. The complex preparation procedure and the low precision Fig. 5: Cross sections of Lance Test samples. The rigid foam cardboard cylinder. In addition the rise pressure and the reaction of the rise height measurement are the main disadvantages of this method. Based on this, Format Messtechnik GmbH came up with a temperature can be measured. The device can be used for the samples show different expansion, whereas the flexible foam

Fig. 3: Two Lance Tests made with a flexible PU foam formulation. The reaction temperature is measured by a thermocouple inserted through the cardboard cylinder. The rise profile is acquired by the software FOAM.

ERLAND E. HOFMANN Format Messtechnik GmbH D-76187 Karlsruhe Germany

TONY TIZZANO

Eurotech Northfield, Ohio 44067 USA



Fig. 4: Lance Test procedure. After mixing, the cup is dropped into the cardboard cylinder to slide down onto the pressure sensor. The expanding foam is measured contactless by the ultrasonic sensor LR 4 and the rise pressure by the FPM 2.