Advantages of Foam Qualification Using the Semi-Automated Test Device FOAMAT®

Format Messtechnik GmbH

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

D. JEFFREY GROSS
EuroTech Distributors
Northfield, Ohio 44067
USA

FOAMAT® features:

- Measurement of foam rise height, temperature, pressure, curing, weight loss, and viscosity
- Master curves for quality assurance testing
- Patented high performance sensors
- Easy to use PC software FOAM

The quality of polyurethane foams depends on what happens during their formation. Constant product quality and continuous production is ensured by measuring the formation parameters prior to the actual foaming process and to compare them with specified standards.

The classic method for characterizing foams is to determine the rise height or rise profile of the foam sample in a cup. With the FOAMAT® (fig. 1) new measurement techniques have become available for all kinds of PU foams, revealing more detailed information of the foam generation process (fig. 2). Offering a standardized test routine, it eliminates most of the human factors by controlling the weighing, mixing, and measuring procedures. The measurement data is stored on a PC and the characteristic measurement results are objectively evaluated by the WINDOWS software FOAM.

The rise profile measured with an ultrasonic fan sensor is the fingerprint of a foam. During quality assurance testing, it is compared with given master curves (fig. 3). For temperature measurement FOAMAT® provides thin thermocouples. The rise pressure is measured with the Foam Pressure Measurement device FPM (fig. 4). The pressure curve determines the gel point and the pressure decay. Measuring the pressure at the bottom of the cylindrical expansion container of FPM allows direct viscosity calculation. This is achieved by using the Hagen-Poisseuille equation (fig. 5) for the viscosity in a tube.

The Dielectric polarization measured with the new Curing Monitor Device CMD gives insight into the electrochemical processes occurring during foam formation. The dielectric polarization shows the formation of intermediates like polyurea and displays the final curing of the foam.

The Integration of a laboratory balance provides automated recording of each foam component. Additionally, the mass loss and the density can be evaluated. The FOAMAT® system has been developed in cooperation with many raw material suppliers, system houses and foam producers. All this expertise is supplied with the system minimizing the time and cost consuming work for building up your own test methods.

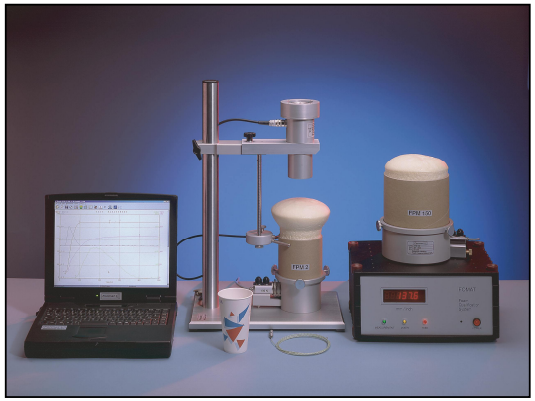

Fig. 1: The foam qualification system FOAMAT® with the ultrasonic fan sensor PFT, a thermocouple and the pressure measurement devices FPM 2 and FPM 150. patent 3621819

www.format-messtechnik.com

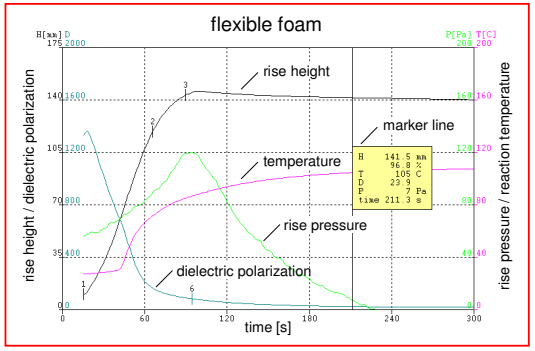

Fig. 2: The measurement data for rise height, temperature, rise pressure, and dielectric polarization is recorded simultaneously by the software FOAM and is displayed in one graph.

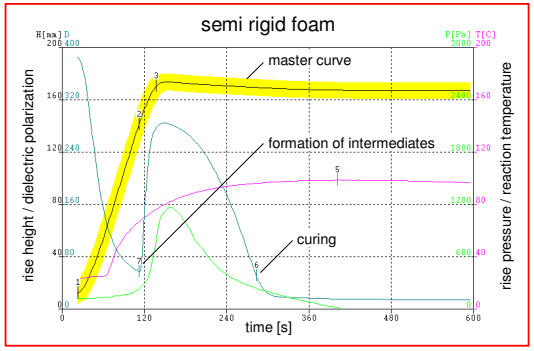

Fig. 3: Graphical display of the rise height, dielectric polarization, rise pressure, temperature, and master curve. The master curve is a tolerance band showing the margins of a "good" foam sample.

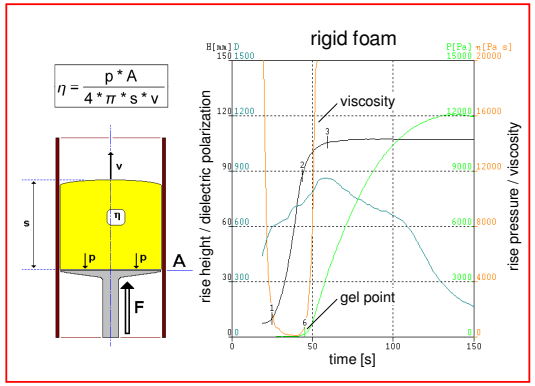

Fig. 5: The viscosity value is calculated by using the physical model of Hagen-Poisseuille, which is applied to a rigid foam measured with FOAMAT®. patent 19730891

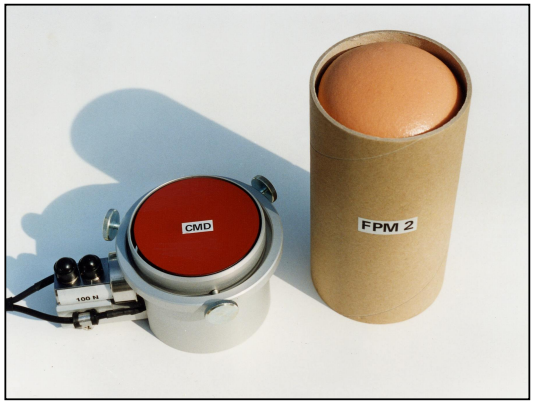

Fig. 4: The polarization sensor CMD, which is integrated into the FPM device measures the dielectric polarization of a foam sample simultaneously with the rise pressure. patent 10104854