Measurement of the Mechanical Properties of Viscoelastic Foams

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R E S I M A T® - Viscoelastic Foam Testing

- **Pressure relaxation during compression**
- **Recovery kinetics after release**
- **Adjustable strain by mechanical alignment**
- **Appearance calculation by the software RESIMAT**

Fig. 1: Test device Resimat* for the measurement of the mechanical properties of viscoelastic foams. Left: Controller unit and software RESIMAT. Right: Ultrasonic sensor and hold/release mechanism.

Viscoelastic foams show a characteristic relaxation behavior when loaded by an external force. This provides comfortable properties for bedding, seating and other applications. Upon removing the load the foam gradually regains its original shape. Standard mechanical foam test devices are not capable of testing the load free recovery process of viscoelastic foams.

Introducing the new test device Resimat* (Fig. 1), Format Messtechnik GmbH, Karlsruhe, Germany, made a new approach for testing the pressure relaxation and the geometrical recovery properties of viscoelastic foams. During a test with Resimat a foam sample of defined dimensions is compressed vertically by means of a pressure plate onto an adjustable reference surface (Fig. 2). At a certain height two electro magnets fix the pressure plate and keep the foam sample strained for a pre-selected hold time. While being compressed a force gage measures the restoring force of the foam. At the end of the hold time the electro magnets are switched off. The sample recovers from the deformation gradually re-gaining its original shape. An ultrasonic distance sensor positioned above the pressure plate continuously records the kinetics of the sample surface.

Measurements have been made with viscoelastic foam samples of different resilience. The pressure vs. time curves show the pressure relaxation describing the creep behavior of the foam. The thickness vs. time curves show the recovery process (Fig. 3). They reveal details of the dynamic features of the foam. The “appearance” is a key parameter of viscoelastic foams showing how long a foam deformation remains visible.

In addition to the mechanical tests, the formation parameters of viscoelastic foams can be measured by the Foam Qualification System FOAMAT (Fig. 4). It provides with reliable data of the rise height, the reaction temperature, the rise pressure and the curing behavior (Fig. 5). The formation parameters as well as the mechanical properties give detailed insight into how the viscoelastic foam can be affected by the formulation.

* Patent pending

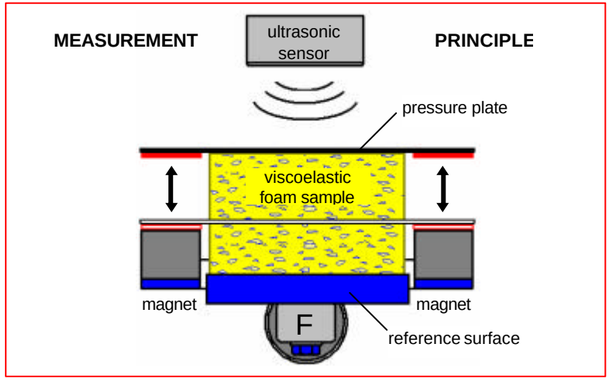

Fig. 2: The viscoelastic foam sample is compressed by the pressure plate. The ultrasonic sensor measures the thickness of the sample and the force gage (F) senses the restoring force.

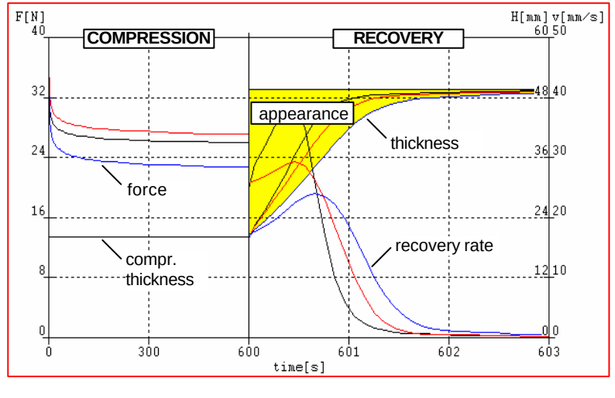

Fig. 3: Graphical display of the restoring force (left) during compression and the thickness of the recovering sample (right) for different viscoelastic foams. The “appearance” is the yellow area.

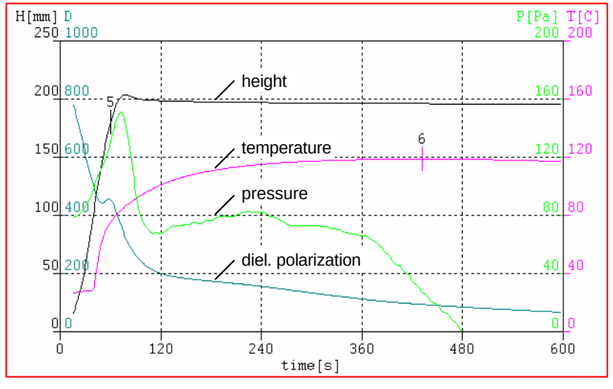

Fig. 5: Rise height, reaction temperature, rise pressure and dielectric polarization of a viscoelastic PU foam measured with FOAMAT.

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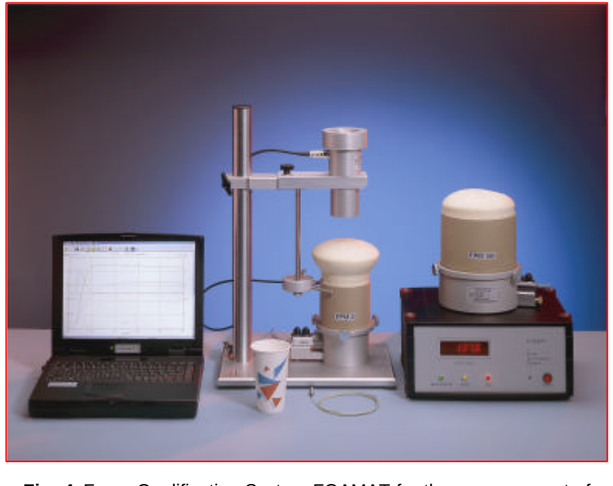

Fig. 4: Foam Qualification System FOAMAT for the measurement of physical parameters during the formation of viscoelastic foams. The test mold is made of cardboard cylinders with different diameters.