CAPILLARY RHEOMETERS with Contifeed

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Abstract

A typical laboratory capillary rheometer is piston fed. Which means a piston pushes material down a barrel and extrudes it through a die. It is normally cold fed from the top manually. Here, we have installed a small-scale screw extruder to push material into the barrel, before the measurement begins.

Introduction

The viscosity, the melt elongation rate, the die-swell, thermal conductivity or the PVT data are only some characteristic values of plastics or elastomers, which can be determined and further evaluated with the RHEOGRAPH capillary rheometer system.

The test barrel is used as a reservoir of the testing material, which provides the melt under specific temperature influence for the further processing.

Normally the operator fills the cold testing material, which is in form of granules, powder, dough or flour like condition, into the test barrel. The use of a manual feeder during the stepwise filling process helps keeping air bubbles out of the melt as much as possible.

Before starting the measurement, the testing material is exposed to a melt time for generating a homogeneous melt source.

This time consuming process can be significantly reduced by using the optional „CONTIFEED.“

A small extruder feeds the test barrel directly with hot melt, respectively with testable elastomer.

At the lower end of the test barrel (just above the die inlet), a defined amount of melt is being filled in by using of a shut-off valve.

Afterwards the shut-off valve is being closed and the measurement is started directly after a short relaxation time.

I. Concept

• Automated melt feeding directly into the test barrel by cylinder/screw (D20x10D)
• The Mini-Extruder is mounted at the rear side of the capillary rheometer
• Additional external fluid cooling system for faster tempering (especially cooling) of the test material feeding zone
• Compact design
II. Design

While this Contifeed mechanism fits on any GOETTFERT capillary rheometer, it is something that needs to be taken into consideration when initially ordering such a system, as it is not easily added later.

Principle:

- Melt source extruded directly into the test barrel (1, blue)
- Pressure measurement and shut-off valve at the barrel entry (2, green)
- After filling the barrel (3), the piston (4, green) presses the melt throughout the die (5, green)
- Simple cleaning by quick uninstalling of parts that had contact with the product
- Twin barrel system for viscosity or other measurements (PVT, Die swell, Thermal conductivity, …) (6, red)

III. Advantages

- Air bubble free filling of the test barrel
- Approx. 50% time saving of the measurement procedure using a more efficient heating
- Shorter heating time for shorter material time under temperature (degradation)
- Especially designed for thermally less stable materials and elastomers
- Detection of process relevant rheological data for injection molding
• Using pre-plastification of powder materials, dry blends such as PVC can be measured

• Only a few parts are required for starting the measurement

• Quick installation procedure

**IV. Evaluation**

![Graph showing pressure over time with and without pre-plastification](image)

**Figure:** Reducing of the material residence time after the homogenization of the pressure course by the pre-classification of the melt feeding extruder (20 mm/100)

**V. Equipment**

Advantages of equipment:

• Compact design

![Diagram of equipment with single parts](image)

**VI. High Comfort**

• Ease of mounting

• Just swivel in the feeding cylinder and fix the flange

• Straight forward handling, easy to learn handling

![Diagram showing swivelling of the feeding cylinder and fixing of the flange](image)

**VII. Ready to Start**
• Complete heated line of the melt flow, no “cold bridges”

• Movable table with the installed components of the CONTIFEED

• Pluggable connections

VIII. All Included

• Mechanical and electrical parts as well as the control system are mounted directly at the RHEOGRAPH

• Quietly running extruder motor

• Easy to dismount for cleaning and servicing

IX. Entry for Testing Material

• Material is easily fed (e.g. elastomers)

• Feeding zone tempered (cooled) by an external thermostat to avoid sticking of testing material

• Only a few parts to dismount for cleaning

X. Conclusion

The Contifeed is a system for those that run PVC, rubber and other materials.