Polymer Industry feature

Rheology Solutions offer material characterisation solutions to measure, monitor and provide reproducible data for quality control, development and production applications that will improve performance within the polymer industries.

Services
An extensive range of technical articles have been produced specific to the challenges found within the polymer industry, these include:

- Quality Control in the Polymer Industry. Introduction to cutting edge technologies and their application in the polymer industry. Rheo 023
- Rheology for the Rubber and Elastomer Industries. Introduction to the influences of rheological and process parameters and methods for their measurement. Rheo 024
- Laboratory and Process Quality Control Techniques for Polymer Manufacturing and Polymer Process Industries. Rheo 376
- Tim’s Top Tips – Explanation and Evaluation of Compounding. Rheo 289
- Tim’s Top Tips – Explanation and Evaluation of Processability. Rheo 290
- Tim’s Top Tips – Explanation and Evaluation of Calendering, Rheo 292
- Tim’s Top Tips – How to Measure Flow and Viscosity Curves. Rheo 364
- Tim’s Top Tips – How to Measure Thixotropy. Rheo 366
- Tim’s Top Tips – How to Measure Yield Stress. Rheo 368

Additionally, an information kit – Rheology Solutions for the Polymer Industries is available. Copies of the technical papers and the solutions kits are available on request from Rheology Solutions.

Products
Polymer processing includes unit operations such as compression, injection and blow moulding and extrusion through a variety of dies. Specifically for the polymer industries, materials characterisation is of critical importance (including fluid related issues like sedimentation, time related structural decay or build-up and post-cure issues like strength of compression or extension) for prediction and management of sharkskin, melt fracture, calendering, die swell, melt homogeneity and short- and long-term dimensional stability of extrudates or moulded parts. These processes depend on fluid rheological parameters such as viscosity, viscoelasticity, creep and recovery, and solid material properties such as behaviour under various compressive and extensional loading conditions. Extensional flow properties dominate processes where stranding occurs and influences time, quality and energy requirements.

Material characterisation parameters are reliable pointers for polymer performance and are critical factors for processability and product quality. Measuring these parameters will improve process and product performance within the polymer industries.

Rheology Solutions exclusively offers a range of instruments and equipment that can be used to quantify rheology related challenges specific for polymer applications.

info@rheologysolutions.com
• product focus

**Modular Torque Rheometer with Measuring Mixer**

The Thermo Scientific HAAKE PolyLab QC with Rheomix 600 mixing chamber is temperature controlled.

The HAAKE PolyLab QC is a new modular torque rheometer which can be connected to an interchangeable measuring mixer, single screw extruder or conical twin-screw extruder.

A typical mixer test is run at a defined rotor speed (shear rate). The material’s response to the shear is recorded as torque and displayed versus time.

Although the temperature of the mixing chamber is constantly controlled, the material’s melt temperature during a test may rise due to the shear introduced. The recorded “Rheogram” (torque and melt temperature vs. time at constant speed) is characteristic for different material types and blends. It can be used as a fingerprint in quality control for outgoing and incoming product inspections. As changes in torque are related to structural changes in the material, a Rheogram can be used to investigate and verify reactions of different additive types or concentration on the samples melting behaviour.

The HAAKE PolyLab QC Rheomix 600 is used to investigate:

- The melting and degradation behaviour of polymers
- Viscosity when adding nano particles or other additives
- Gelation and plastification behaviour of PVC dry-blends
- Flow and curing behaviour of thermosetting plastics
- The influence of different additives such as carbon black, fillers, lubricants, accelerators and sulphur for rubber mixers
- Masticating and vulcanising behaviour of elastomers
- Oil adsorption of carbon black
- Adsorption of DOP for PVC dry blends
- Torque in regard to individual and combined influences of fillers and additives
- Processability of plastics
- Electric conductivity measurements for rubber mixers

The Thermo Scientific HAAKE PolyLab QC with the HAAKE CTW 100 QC twin-screw extruder is used for continuous compounding and plasticising is the ideal extruder in the HAAKE PolyLab QC system.

This is a counter rotating conical twin-screw compounder, with intermeshing screws, that will give well-defined residence time for faultless production of process-critical polymers.

The gentle but intensive dispersing capabilities are ideal to mix additives and pigments. Dies and downstream ancillaries are compatible with the 19/25 QC-D single-screw extruder.

**Applications**

-Testing of the plasticising behaviour
-Testing the performance of additives and fillers
-Measuring of the melt temperature and pressure along the barrel to optimise process parameters
-Provide a homogeneous and constant flow melt
-Production of strands, sheets, cast and blown films
-Extrusion of ceramics and feed stock
-Melt rheology

**Features**

- Rod dies & water bath for strand extrusion
- Sheet & ribbon dies
- Blown film dies & take off tower
- Filter test

The HAAKE PolyLab QC is available as a bench or floor model.
The Thermo Scientific EuroLab 16XL bench top twin-screw extruder is used for research, development, quality control, and small-scale production. Prepare small or different samples in a short time with a minimum of product waste.

From sample batches of 50 grams up to outputs of 10 kg/h, the bench mounted 16 mm EuroLab XL twin-screw extruder is the heart of a complete compounding and sample preparation system. The segmented screw configuration with modular and extendable barrel design delivers flexibility for the full range of polymer processes.

A horizontally split barrel of 25:1 L/D can be changed to 40:1 with a bolt on, plug and play extension. Once attached, the extension is automatically recognised by the EuroLab 16XL and the heating controls appear on the touch screen. The segmented top barrel half is constructed in modules and is easy to reconfigure and clean. Barrel segments are available for feeding solids and liquids or for venting.

Secondary feeders and vacuum pumps can form part of the system.

A rugged, colour touch-screen interface incorporates real-time trending as standard. An option is available to log data on a remote computer for analysis and archiving. Also offered is a PLC control with real-time trending display and recipe storage to preset extruder parameters for repeatable process conditions. The advanced heater algorithm delivers precise temperature control. A low maintenance, brushless 2.5 kW motor drives the screws at 1000 rpm.
Further information is available by contacting Rheology Solutions:

**Telephone:** 03 5367 7477  
**Facsimile:** 03 5367 6477  
**Email:** info@rheologysolutions.com  
**Web:** www.rheologysolutions.com