

## **New Developments in High Throughput Rotational Rheology for Polymer Melts.**

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Thorough knowledge of physical and chemical material properties is crucial for new product developments. Using conventional material research, limited research data on material characterization delivers limited answers to interesting research questions. In the field of Rheometry, High Throughput (HT) solutions exist for samples ranging from low viscosity liquids to paste like materials. However, the huge group of melts is excluded from automation due to high temperature requirements as well as difficult sample application and cleaning. In this research, we demonstrate the new developments of a HT solution for rheological polymer melt applications.

The HT solution has the comparability to conventional rheometers while meeting throughput demands for Design of Experiments. The development of an automation solution around a conventional rheometer offers flexibility and assures high reproducibility. The measurements are executed in a robotic cell featuring a fully automated rotational rheometer. Cold solid polymer discs are stored in a tray inside the robot cell. After measuring geometries have been preheated up to 300°C, the robot inserts the polymer discs into the rheometer with a high temperature vacuum gripper. A specifically designed rotational blade automatically trims the melted polymer disc. In HT approaches for liquids and paste-like samples, the upper and lower geometries are removed and cleaned separately after the measurement. Polymer melts would pull strings throughout the entire cell, hence they have to be removed from the rheometer together at the same time. This problem is solved with a combined gripper tool, which can be used to load the rheometer separately but unload the whole stack of lower geometry, sample and upper geometry all at once. In 2013 the main research focused on developing a method for automatic cleaning of the measurement geometries in order to close the loop. This new developments will be presented for the first time.

Automated rheology has proven to be a very useful tool which helps companies to compete in modern material research. Rheological information is gained 24 hours a day, 7 days a week and is immediately available for research. The presented developments for polymer melt applications will support future material explorations in the polymer industry.