

Spiral Flow Mold for the HAAKE MiniJet Pro Injection Molding System

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A quick test to distinguish plain and filled polymers, e.g. glass fibers, reinforced PA or MIM, is to inject the polymer melt in a spiral mold. Information about the processability and flow of the polymer melt at high shear rates comparable to the conditions in the injection molding process can be easily accessed.

First the spiral mold is inserted in the heated mold holder to warm up. Afterward the polymer pellets or powders are filled directly in the heated cylinder of the Thermo Scientific™ HAAKE™ MiniJet Pro Injection Molding system— see Fig. 1 and Fig. 2. After compression and melting of the polymer in the heated cylinder, the injection piston is inserted and the instrument is ready for injection.

Another way to fill the heated cylinder with polymer melt is to use the Thermo Scientific™ HAAKE™ MiniLab micro-compounder or other Thermo Scientific™ HAAKE™ extruders/compounders with a special bypass valve on a $\frac{1}{2}$ " 20 UNF measuring port.



Fig. 2: Filling of pellets in the heated cylinder.



Fig. 1: The HAAKE MiniJet Pro injection molding system.

The parameters set for the test are in the Table 1.

Description	Value
Temperature of the heated cylinder	280 °C
Temperature of the mold holder	100 °C
Pre heating time of the mold	10 min
Injection pressure	600 bar
Injection time	10 sec
Post pressure	0 bar
Post pressure time	0 sec

Table 1: Parameter set for the test

After the injection cycle is finished, the mold can be removed and opened for inspection.



Fig. 3: Sample 1 - new sample was injected three times.

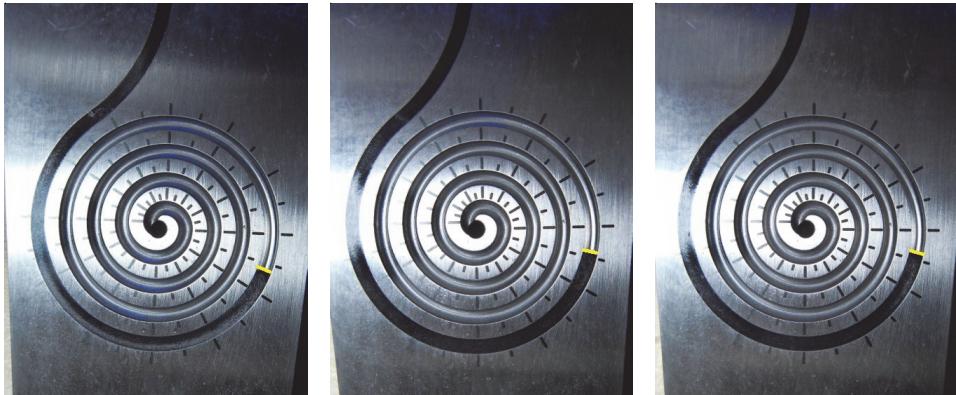


Fig. 4: Sample 2 - new sample was injected three times.

The flow length of both samples are different; sample 1 flowed (Fig. 3) further than sample 2 (Fig. 4). A longer flow length correlates with a lower viscosity of the material. Even if we consider the repeatability \pm one scale unit, the difference between the two samples is significant. Sample 1 is less viscous than sample 2. This laboratory method provides valid measurements that have to be correlated with the performance of material in the real-world process.

After some data and experience are collected, the spiral mould can be a useful tool for a quick pre-scan of the materials for processability.

To ensure repeatable results, it is important to always keep the filling and melting procedures and the pre-heating time of the mold exactly the same. The injection settings also have to remain the same.

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