Improved performance and product quality by automated geometry optimization of extrusion dies

Wortberg Johannes, Saul Kenny

Based on previous works, an enhanced method for automatic geometry optimization is topic of current research activities. In continuation to the automatic optimization of simple flow channel geometries like 90° elbows, this project comprises the optimization of more complex geometries like spiral mandrel dies. The main ambition of this research activity is to reduce the time of development and to simplify the design of complex extrusion dies. Using software systems like Optimus, Catia, Fluent for Catia and Fluent the developed process meshes the geometry of an initial CAD-model, calculates the flow behavior, interprets the results and changes the CAD-model autonomously until the optimization criteria defined before are fulfilled. The process is capable to optimize the performance of the spiral mandrel die due to an embedded ability to vary important construction parameters like the channel width, gap width, number of spirals as well as the helix- or wrap angle autonomously. Optimization criteria can be (e.g.) a low pressure loss, homogeneous velocity distribution or even an improved purge behavior. Manufacturing restrictions can be considered and the combination of different optimization criteria can be taken into account to prevent non-realistic design proposals. In first optimization runs the method showed a close match with analytically calculated solutions. This geometry proposal will be manufactured and validated in a blown film test-bench.