OP-4-254

Tuesday, May 10, 2011, 11:30am-11:50 am
Room: Karam 3

COMPARING AUTOMATED DIE OPTIMISATION WITH REALITY

W. Michaeli [a], Ch. Hopmann [a], Ch. Windeck [a,*], Ch. Kremer [a], S. Elgeti [b], M. Probst [b]

a Institute of Plastics Processing (IKV), RWTH Aachen University, Germany and b Chair for Computational Analysis of Technical Systems (CATS), RWTH Aachen University, Germany.

**Corresponding author: windeck@ikv.rwth-aachen.de*

The design process of profile extrusion dies greatly depends on the experience of the die designer. Starting from the first design, the die designer adjusts the geometry of the flow channel iteratively until the profile meets the quality restrictions. These iterative running-in trials are time- and cost-intensive since the extrusion line is occupied. Furthermore, small companies depend on the knowledge and experience of the die designer which are hard to replace.
At RWTH Aachen University, two institutes are sharing their expertise for plastics processing and numerical optimisation algorithms in order to develop an approach to substitute some of the manual running-in trials by automated numerical optimisations of the flow channel geometry. By this, the design process gets less expensive and less dependent on the experience of the die designer.
The optimisation process consists of four steps. First, the melt flow through the original geometry is calculated using a FEA-flow solver. Then, the flow is evaluated according to a previously defined quality function. The quality function is a mathematical description of the goals of rheological die design. The value of the quality function is used by the optimisation tool to update the design parameters which are then transformed to a geometry deformation a deformed geometry. In the last step, the deformation is applied to the FEA-grid and the whole process starts again without user interaction.
First geometrical optimisations of a simple three-dimensional flow channel are computed. The melt flow through an optimised flow channel with an L-shaped outlet geometry is compared to the flow through the original flow channel in order to evaluate the prediction of the automated optimisation algorithm. As the L-shaped profile consists of sections of different cross-sections, the algorithm has to find a geometry that leads to a homogeneous velocity distribution at the die exit.