Validation of a moving mesh finite volume interface tracking method through the numerical simulation of the newtonian extrudate swell

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Abstract

The geometrical modifications that take place when the flowing material leaves a confined flow inside a channel and moves freely without the restrictions promoted by the walls, commonly designated by extrudate swell, is a relevant phenomenon in several polymer processing techniques. For instance, in profile extrusion, the extrudate cross-section is subjected to a number of distortions motivated by the swell, which are very difficult to anticipate, especially for complex geometries. To circumvent those problems numerical modelling might provide useful information to support design tasks, i.e., to allow identifying the cross section geometry which produces the desired profile, after the changes promoted by the extrudate swell.
In this work we employed an open-source moving mesh finite volume interface tracking solver to simulate the extrudate swell process in profile extrusion. The data provided by Mitsoulis et *al. (E. Mitsoulis, G.C. Georgiou, and Z. Kountouriotis. A study of various factors affecting Newtonian extrudate swell. Computers & Fluids, 57:195{207, 2012)* on the simulation of the extrudate swell flow of a Newtonian fluid at different Reynolds number is considered as the reference for validation. The results obtained with the OpenFOAM solver show a very good agreement with the reference data.

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