EUROGEN 2021
17-19 May 2021, Athens, Greece

On the simulation of the Newtonian fluid Extrudate Swell using a moving mesh finite volume interface tracking method

Ahmad Fakhari[a], Olga Sousa Carneiro[a], Željko Tuković[b], Célio Fernandes[a]

[a]*Institute for Polymers and Composites, University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal; ahmadfakhari@gmail.com (A.F.); olgasc@dep.uminho.pt (O.S.C.); cbpf@dep.uminho.pt (C.F.)*

[b]*University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Ivana Lučića 5, Zagreb, Croatia; Zeljko.Tukovic@fsb.hr (Z.T.)*

Abstract

The extrudate swell, 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, 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. As happens in many industrial processes, 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 study the capability of an open-source moving mesh finite volume interface tracking solver, to simulate the extrudate swell process in profile extrusion. For this purpose, 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.

Acknowledgments: The authors would like to acknowledge the Minho University cluster under the project NORTE-07-0162-FEDER-000086 and the Minho Advanced Computing Center (MACC) for providing HPC resources that contributed to the research results reported within this abstract.