Modelling and optimization of mold clamping and parison inflation phases of extrusion blow molding

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Extrusion blow molding is one of the most popular processes for manufacturing hollow parts made of thermoplastics. The few numerical simulation codes developed for the extrusion blow molding process, do not allow the modelling of all the relevant phases comprised in the process. The authors of this work are developing a set of computational tools aiming the numerical modelling of all the relevant phases of the extrusion blow molding process, namely: parison extrusion, mold clamping, parison inflation and cooling, employing the OpenFOAM computational library.

This works presents the set of modelling tools developed to simulate both the clamping and inflation phases of the extrusion blow molding process. During clamping, the parison is placed between the two halves of the mold, which are then clamped together, deforming the parison and forming the mold cavity. Along the inflation, pressure is applied through air blown into the clamped parison, inflating it until it touches the mold cavity surface.

The implemented model comprises an explicit calculation of the parison's displacement, which is defined as a finite area mesh in OpenFOAM, and allows the use of two constitutive models: linear Elastic and multimode K-BKZ integral viscoelastic. The results obtained with the code allow the prediction of the final parison's thickness distribution, thus being and useful tool to support design activities related to this manufacturing process.

The presentation will also cover studies on the optimization of the extrusion parison thickness distribution to achieve a target thickness distribution on the final part.

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