Modelling and simulation of counter blow and final blow processes in bottle manufacturing

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Pavel B. Ryzhakov*, Julio García Espinosa† and Eugenio Oñate*

* Centre Internacional de Mètodes Numèrics en Enginyeria (CIMNE)
Universitat Politècnica de Catalunya (UPC)
Campus Norte UPC, 08034 Barcelona, Spain
†Universitat Politècnica de Catalunya (UPC), Campus Nàutica, Edif. NT3, C. Escar 6-8, 08039, Barcelona, Spain

Contact e-mail: pryzhakov@cimne.upc.edu

ABSTRACT

We propose a numerical technique for the 3D simulation of the glass forming (Counter Blow and Final Blow processes) based upon a Lagrangian formulation. Adopting the basic philosophy of the Particle Finite Element method (PFEM) [1,3], we introduce several new features adapting the strategy to suit the problem of interest. A smart mesh update strategy and a modification in the treatment of the mass conservation equation are introduced. A contact algorithm, particularly beneficial for the final blow process simulation is developed. The methodology allows for a precise prediction of the final topology of the glass.

The modified fractional step method [2] is applied for solving the governing equations of the fluid. This method on the one hand inherits the computational efficiency of the original fractional step method, and on the other hand shows better mass conservation features. Additionally, it allows to avoid the imposition of the error-prone zero-pressure boundary condition at the free-surface. The mass conservation features of the proposed methodology are particularly attractive taking into account the importance of the correct prediction of the product's wall thickness.

REFERENCES

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