Development of a coupled thermomechanical model for press blow processes for forming of glass containers

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ABSTRACT

In this work a numerical model, based on the finite element method, for forming of glass containers is presented. Glass forming processes involve coupled thermo-mechanical phenomena in which heat transfer and material viscous flow influence each other, as glass viscosity is highly dependent on temperature and the significant shape changes and contact conditions affect the temperature distribution. During the overall process, in a very short time, glass changes from a molten state to a solid state and therefore adequate cooling conditions within and against the moulds must be set appropriately. The ultimate aim is to set the better process parameters so that the final products will have the required geometrical shape and thickness distribution.

From the numerical point of view geometrical modelling must be robust so as to adjust to the different sequenced stages, namely gob dropping into the blank mould, parison shaping by press or blow in the blank mould and final forming by gravity and pressure in the blow mould. Remeshing techniques requiring adequate variable transfer and different thermal and mechanical contact conditions between glass and plunger or moulds must be taken into account adequately. Also effective treatment of the incompressible conditions associated with glass flow must be dealt with appropriately. The numerical model developed, addressing all these issues is validated with real industrial products.

REFERENCES

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Acknowledgement: Authors gratefully acknowledge the funding of Project NORTE-01-0145-FEDER-000022 - SciTech - Science and Technology for Competitive and Sustainable Industries, cofinanced by Programa Operacional Regional do Norte (NORTE2020), through Fundo Europeu de Desenvolvimento Regional (FEDER).