Experimental validation of a model for gas-assisted injection moulding simulations
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Published: 01/01/1997

Document Version
Accepted manuscript including changes made at the peer-review stage

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Download date: 04. Jan. 2019
Introduction

In Gas-Assisted Injection Moulding (GAIM), gas is injected into a mould that is partially filled with polymer. The gas drives the molten polymer core further into the mould until it is filled completely (Fig. 1).

![Polymer and gas in GAIM process](image)

A computational model has been developed to simulate GAIM processes. This model has to be validated experimentally.

Experimental methods

- Gas injection experiments were carried out in two different moulds:

![Cylinder and Plaque-with-rib moulds](image)

- Polystyrene inserts were placed in the mould and heated to a uniform temperature.
- Nitrogen gas was injected either before or after the mould started to cool down.
- Depending on the shear rate, the polystyrene exhibited either Newtonian or shear-thinning viscosity behaviour.
- After cooling down, the polystyrene specimens were released from the mould. Their polymer skin thicknesses were measured and compared with the simulation results.

Results

Fig. 4 Experimental (left) and numerical (right) gas distributions in cylinder. Top to bottom: Newtonian, shear-thinning, and non-isothermal case.

![Numerical and experimental gas distributions in cylinder](image)

Fig. 5 Numerical (left) and experimental (right) gas distributions in plaque-with-rib cross sections.

![Numerical and experimental plaque-with-rib cross sections](image)

Fig. 6 Numerical (lines) and experimental (error bars) residual wall thickness along cylinder or rib length.

Conclusion

The comparison of gas injection experiments and simulations shows that the developed computational model is able to correctly predict the gas distribution inside a GAIM product.