Abstract Submitted
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Particle Image Velocimetry During Injection Molding THOMAS BRESS[1], Exponent Failure Analysis Associates, DAVID DOWLING, Dept. of Mechanical Engineering, University of Michigan — Injection molding involves the unsteady non-isothermal flow of a non-Newtonian polymer melt. An optical-access mold has been used to perform particle image velocimetry (PIV) on molten polystyrene during injection molding. Velocimetry data of the mold-filling flow will be presented. Statistical assessments of the velocimetry data and scaled residuals of the continuity equation suggest that PIV can be conducted in molten plastics with an uncertainty of ± 2 percent. Simulations are often used to model polymer flow during injection molding to design molds and select processing parameters but it is difficult to determine the accuracy of these simulations due to a lack of in-mold velocimetry and melt-front progression data. Moldflow was used to simulate the filling of the optical-access mold, and these simulated results are compared to the appropriately-averaged time-varying velocity field measurements. Simulated results for melt-front progression are also compared with the experimentally observed flow fronts. The ratio of the experimentally measured average velocity magnitudes to the simulation magnitudes was found on average to be 0.99 with a standard deviation of 0.25, and the difference in velocity orientations was found to be 0.9 degree with a standard deviation of 3.2 degrees.

[1]formerly at the University of Michigan

David Dowling
Dept. of Mechanical Engineering, University of Michigan

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