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PREDICTIVE ENGINEERING TOOL FOR INJECTION MOLDED THERMOPLASTIC COMPONENTS

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Abstract: Automotive and electronic components are two prosperous industries that rely deeply on injection molding of thermoplastic polymers. The expense associated with creating an injection mold and its eventual retooling for problems discovered in production, make molding simulation of high value to industry. Relevant variables of this process are the injection pressure, temperature profile, and flow rate among others. Injection molding process is a typical example of a moving boundary problem. In order to be able to simulate such processes, the moving boundary must be adequately solved among the other relevant variables as temperature, pressure and velocity field. Through this paper a numerical model for three-dimensional mould filling simulations has been developed aiming to predict the complex evolution of process variables. Accuracy of filling simulation and computational tool's predicting ability of the most important variables are validated against data obtained from real injection molding process. Double-gated parts were produced in a laboratory injector machine and pressure and temperature profiles were measured in the instrumented mold. The analysis geometry used for this study present weld line formation and geometry lateral boundary effects; this type of flow field is representative of real injected molded parts with complex three-dimensional geometries.