

### **3D finite element solution of the flow in single and twin-screw extruders.**

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This work is aimed at the numerical modeling the flow inside screw (single screw and twin-screw) extruders. In injection molding, polymers are plasticized (melted by viscous generated heating) inside screw mixers and then pushed into the cavity to form the desired part. Important efforts has been devoted during the last decade to the numerical modeling of the injection molding process with more and more emphasis being given to three-dimensional modeling. However, little attention was given to the 3D solution of the flow inside the plasticization unit. Here we present applications of an immersed boundary finite element method that is capable of solving the flow in the presence of complex non-stationary solid boundaries. The method will be first validated against the solution in a rotating reference frame for the case of a single screw mixer and the applied to a twin-screw mixer. For instance the flow is considered isothermal and the material behaving as a generalized non-Newtonian fluid. Because the viscosity depends on the shear rate, solutions will be shown for various rotation velocities of the screw. The method is shown to give very accurate results and opens the way for in-depth investigation of the material behavior in the screw.