Flow of Polymer Melts in Plane- and Axi-Symmetric Converging Dies

The extensional flow has considerable influence on the pressure loss in converging flows, which are present in both extrusion and injection moulding. Both plane- and axi-symmetric converging flows have been studied with LDPE, HDPE and PS. The transient extensional viscosities are determined in all cases. The extensional viscous description used is the one proposed by Cogswell. The extensional viscosities in the two different flow fields are compared. The plane-symmetric extensional viscosity is found to be larger than the axi-symmetric for the HDPE melt. The two viscosities are comparable for the LDPE and the PS melts. Furthermore, the pressure losses are characterized with the Deborah number in which the characteristic time of the material is shear rate dependent and the characteristic time of the flow is Hencky strain rate dependent.