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A COMPREHENSIVE STUDY OF A MOLTEN LDPE IN CAPILLARY FLOW

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A comprehensive study of excess pressure losses due to end effects (mainly entrance) in the capillary flow of a molten LDPE is undertaken both experimentally and numerically. The capillary geometry has an abrupt entrance angle and different L/D lengths. In the numerical study, the effects of pressure and temperature on the viscosity, as well as compressibility, are studied independently and all together. The purpose is to determine the individual effects of these parameters on the flow curves. The numerical simulations use a multimode K-BKZ viscoelastic model that fits well all the rheological data collected independently using various rheometers. Further simulations with a viscous (Cross) model have shown that they severely under-predict the entrance pressure by an order of magnitude. Thus, the viscoelastic spectrum together with the extensional viscosity play a significant role in predicting the pressure drop in contraction flows. For LDPE, the temperature-dependence and compressibility are not very important, while the pressure-dependence of viscosity has a stronger effect in obtaining the flow curves and hence the end pressure losses.