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The Effect of Barrel Diameter And Rotation on the Numerical Simulation of Single-screw Extruders

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Simulation of the metering section where the material is fully molten would appear to be the simplest. This section, however, can be problematic since previous research has shown that the standard assumption of barrel rotation is not appropriate for the analysis. Moreover, all sections of the extruder are impacted by whether the simulation utilizes a reference frame of barrel rotation or the actual screw rotation. The Simulation will be compared to data. A 500 mm diameter extruder was melt fed with the 0.8 MI resin at a rate of 11,800 kg/h and a screw speed of 46 rpm. The feed temperature and pressure of the resin was measured at 225°C and 0.1 MPa, respectively. The extruder was relatively long, but only the first 5.6 diameters need to be simulated to demonstrate the effect of diameter on simulation accuracy. For this extruder, the feed pipe was 500 mm in diameter and thus forced the first diameter of the extruder to be at a temperature and pressure of 225°C and 0.1 MPa. This section of the screw started with a 1.5 diameter long, double-flighted feed section with a depth of 60 mm and a lead length of 750 mm. The next section of the screw was a 1 diameter long, double-flighted transition section with a lead length of 625 mm. The last section was a 3.1 diameter long, double-flighted constant depth meter section with a depth of 27 mm and a lead length of 500 mm. The flight widths for the flighted sections were 20 mm and the flight clearance was 0.5 mm.