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Finite Element Analysis of Melt Mixing Zone in Twin Screw Extruders with Special Geometries

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Tip clearance between two screws or screw and barrel plays an important role in the mixing performance of twin screw extruders. We performed the computational flow analysis in the fully-filled melt mixing zone for twin screw extruders with special geometries, i.e. grooved barrel or multi-clearance kneading disk, using the finite element method and discussed the distributive mixing, dispersive mixing, viscous heat generation, etc. for the twin screw extruders with special barrel or screw geometry as well as conventional one. The results revealed that the optimal value of clearance enables the averaged shear stress against the polymer materials to be larger for both special barrel and screw. The grooved barrel also shows better distributive mixing due to the complicated flow field in the grooved region and suppression of the maximum viscous heating.