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Introduction

Spiral Dies¹

- Dies used to produce an annulus of resin
- Most popular die used for film extrusion
- Films are drawn in the axial direction and blown outwards in the radial direction to decrease the thickness

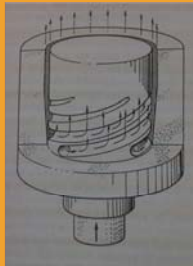


Figure 1: Spiral Die

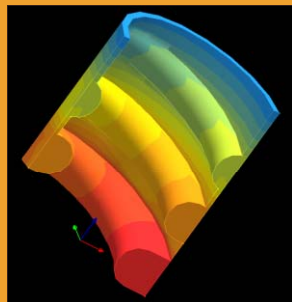


Figure 2: Spiral die 3D simulation

Compuplast VEL

- Simulates extrusion processes for improving designs, process optimization or for education and training

Methods

Experimental Procedure

- Maintain process temperature while varying shear rate
- Quench cool resin, measure thickness variation and compare to simulation predictions



Figure 3: Experimental die

Solvers

- Standard (2D) and Expert (3D) solvers have been developed
- Advanced solver has aspects of both

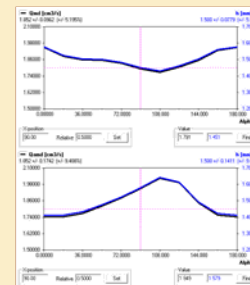


Figure 4: Thickness variation predictions (Top: Standard, Bottom: Advanced)

Materials

Dow Chemical Engage Resins

- Linear polyolefin resins which allow for higher shear rates to be investigated
- Varying MFI and specific gravity allows the assessment of how the software interprets these changes

Table 1: Resin property summary²

| Resin | MFI (g/10 min) | Specific Gravity |
|-------|----------------|------------------|
| 8100 | 1 | 0.870 |
| 8200 | 5 | 0.870 |
| 8450 | 3 | 0.902 |
| 8480 | 1 | 0.902 |

Project Objectives

- To determine which model yields the most accurate simulation
- To determine if the Advanced model yields a good compromise between accuracy and computation time