Extrudate swell behaviour of polystyrene (PS) and linear low-density polyethylene (LLDPE) melts was investigated using a constant shear rate capillary rheometer. Two capillary dies with different design configurations were used, one being single flow channel and the other being dual flow channel. A number of extrudate swell related parameters were examined and used to explain the discrepancies in the extrudate swell results obtained from the single and dual flow channel dies, the parameters including output rate and output rate ratio, power law index, wall shear rate, wall shear stress, melt residence time, pressure drop induced temperature rise, flow channel position relative to the barrel centerline, and the flow patterns.

It was found in this work that the power law index (n value) was the main parameter to determine the output rate ratio and the extrudate swell between the large and small holes for dual flow channel die, the greater the n value the lower the output rate ratio and thus decreased extrudate swell ratio. The differences in the extrudate swell ratio and flow properties for PS and LLDPE melts resulted from the output rate ratio and the molecular chain structure respectively. The extrudate swell was observed to increase with wall shear rate. The discrepancies in the extrudate swell results from single and dual dies for a given shear rate were caused by differences in the flow patterns in the barrel and die, and the change in the melt velocities flowing from the barrel and in the die to the die exit.