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Polymer extrusion is an important manufacturing process used to produce a vast array of commercial plastic products. For example, flat polymer sheets, plastic tubes, window channels, and other complex shapes of fixed cross section are produced by this continuous forming process. A primary objective in the design of a polymer extrusion die is to determine the optimal flow channel geometry that forms a desired cross section from a continuous molten polymer stream. To ensure that the desired cross section is obtained, sheeting dies are designed to deliver a uniform flow rate and temperature across the die exit.

This research presents a polymer sheeting die design methodologies which integrates finite element flow simulations, numerical optimization, and design sensitivity analysis to compute die cavity geometries capable of meeting various demanding performance criteria. The main objective of this research is to develop the design methodologies of polymer extrusion and their applicability in efficiently modeling and simulating polymer processing and die designs. An example of industrial extrusion die and various polymers are provided to exemplify the polymer processing design methodology. From the result of this research, it is shown that the proposed methodologies can be effectively used to design polymer extrusion dies and improve the performance of polymer material processing.