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Residual Wall Thickness Distribution at the Transition and Curve Sections of Water Assisted Injection Molded Tubes

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Water assisted injection molding technology has been used to manufacture plastic tubes in recent years, due to its light weight, relatively lower resin cost per part and faster cycle time. The residual wall thickness around dimensional transitions and curved sections can significantly affect molded parts strength and is of great concern. This research investigated the uniformity of the residual wall thickness distribution in water assisted injection molded circular tubes with dimensional variations and curved sections. Experiments were carried out on an 80-ton injection-molding machine equipped with a lab scale water injection system, which included a water pump, a water injection pin, a water tank equipped with a temperature regulator, and a control circuit. The material used was semi-crystalline polypropylene. It was found that the wall thickness was not uniform near transitions. With the addition of fillets with proper angles around transitions, the uniformity of residual wall could be greatly improved. The residual wall thickness in curved sections was thick around the outer wall and thin around the inner wall. Nevertheless, the experimental results suggest that water assisted molded parts exhibit more uniform thickness distribution at transition and curve sections than gas assisted molded parts.