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Water Assisted Injection Molded Glass Fiber Reinforced Nylon-6 Composites

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This report was done to study experimentally the water-assisted injection molding process of glass fiber reinforced polyamide-6 (Nylon-6) composites. 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 pressure accumulator, a water tank equipped with a temperature regulator, and a control circuit. The materials used were Nylon and 30% glass fiber filled Nylon composites. A spiral mold cavity was used to mold the composites. After molding, the lengths of water penetration in molded parts were measured. The effects of different processing parameters on the lengths of water penetration were determined: melt temperature, mold temperature, melt filling speed, short-shot size, water pressure, water temperature, water hold and water injection delay time. X-ray diffraction was employed to identify the morphology of molded materials. Mechanical property tests were also performed on the water assisted injection molded parts. In addition, the in-mold temperature distribution of the polymeric materials during the cooling process was measured. Irregular water penetration in molded parts was observed, and water temperature was found to affect the crystallinity distribution of molded parts. Nevertheless, its effects on the tensile properties of molded materials were relatively limited.