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IMPROVING THE POLYMER SURFACE QUALITY BY INFRARED RADIATION DRIVEN DYNAMIC MOLD TEMPERATURE CONTROL

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The influence of a dynamic mold surface temperature control on weld lines, sink marks and gloss of injection molded parts was investigated. By using infrared radiation, the cavity insert was heated up prior to the injection of the polymer. Several polypropylene and polycarbonate grades were examined. Besides the obvious influence of the cavity insert temperature, the injection rate was analyzed. The weld lines and the sink marks were investigated by surface topography analysis; the structure replication into the polymers was determined by roughness measurements. The visual appearance of these surface defects was quantified by methodologies developed and patented at the PCCL. Furthermore, correlations between processing conditions and visual perceptibility of these surface defects were analyzed. The higher the insert temperature was, the smaller the weld lines were. Moreover, the replication of both, a mirror-finished and a grained cavity surface, into the polymers was improved by rising the insert temperature. However, the influence of the insert temperature on the sink marks varied from polymer to polymer. The injection rate showed very similar dependencies. Even though the polymer part surface quality was improved due to the dynamic mold temperature control, the cycle time was shorter than in conventional injection molding. This was realized by cycle-parallel heating and injection as well as rather low cooling agent temperatures in the cavity insert