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Improving Warpage with Milled Groove Square Shape Conformal Cooling Channels

Abstract

Warpage is a common issue in an injection moulding process due to non-uniform temperature variation causing differential shrinkage on the moulded parts. In designing moulds for injection molding process, it is very difficult to achieve efficient cooling with uniform thermal distribution. Most of researchers focus on an optimisation of processing parameters to improve the warpage. However, the conformal cooling channels have advantages with the uniform distance between center of cooling channels and mould surfaces in order to get a better thermal distribution thus reducing the warpage. This paper presents the Milled Grooved Square Shape (MGSS) conformal cooling channels which provide more uniform in cooling and have a bigger effective cooling surface area cross sectional area and comparing to circular and others type of cooling channels with similar cross section. A case study on front panel housing is investigated and the possibility of fabrication the conformal cooling channels on hard tooling for injection moulding process which is easier to design, fabricate and assemble compared to other method are presented. The performance designs of straight drilled are compared to the two types of MGSS conformal cooling channels by using Autodesk Moldflow Insight (AMI) 2012. The analyses show that the both types of MGSS conformal cooling channel suggested can provide a more uniform thermal distribution and able to reduce the warpage on the molded part compared to the straight drilled cooling channels.

Keywords; Conformal Cooling Channels, Moulding, Plastic Behavior, Polymers