IMPLEMENTATION OF MICRO HOT RUNNER SYSTEM IN INJECTION MOLDING MULTIPLE MICRO COMPONENTS

Shi-Chang Tseng and Meng-Yu Jiang

Mechanical Engineering, National Yunlin University of Science and Technology

123, Sec.3, University Avenue, 640 Taiwan

Abstract

In present industrial applications, most of the hot runner systems are suitable for molding large-sized products. Only few studies are focused on small-sized hot runner system of multi-cavity products. The study is to develop a micro hot runner system for multiple micro molded components. The major concerns of this design are to reduce waste materials, to shorten the cycle time, to lower the cost and to instantly form multiple micro components, or to put multiple micro structures in small-spaced products.

Twelve cell-phone keypads were selected as an example to be studied. And a micro-hot runner system was developed for their micro molding. Based on runnerless and flow balance, a runner plate to achieve uniform flow was proposed. The CAE software was used to simulate and to obtain optimum flow balance. To understand how different runner dimensions influence the uniformity of product's weight, two different runner plates were made and compared. The experimental results reveal that the weight uniformity by the optimum runner design is better.

Results and Discussions

A new micro hot runner system was developed for micro molding multiple micro components or parts in a constrained small space. The main concept of the micro hot runner system is demonstrated in Fig. 1. Twelve cell-phone keypads were selected as an example to be studied. Unlike the traditional cold runner design (Figure 2), The micro hot runner module is introduced in this work. It can help save the runner material and reduce injection pressure and cycle time. Most of commercial hot runners are too large to mold micro components. Hence a micro hot runner system is developed in this study. One of the key components, micro runner tubes were fabricated by integrating micro grinding, polishing and electroforming as shown in Fig. 3. This method can provide each micro runner tube with a tiny capillary for polymer melt to flow into each micro cavity. Computer simulation was used to obtain more uniform flow and thermal fields inside the micro hot runner module. Better results for flow balance are shown in Fig. 4.

References:

1. E. W. Becker, et al., 1986, “Fabrication of microstructures with high aspect ratio and great structural heights by synchrotron radiation lithography, galvanic-forming and plastic molding”,

Microelectron. Eng., PP35~36.

Acknowledgement:

Thank to financial support by the National Science Council in Taiwan.

NSC97-2221-E-224-009-MY2

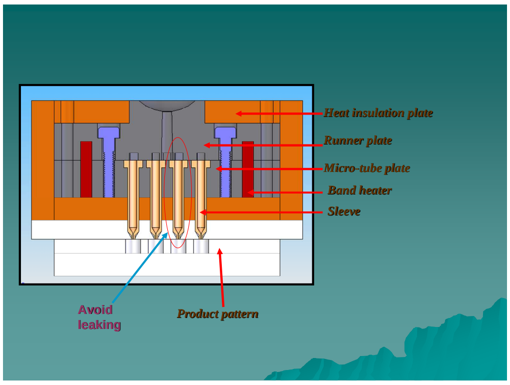


Fig. 1 Schematic drawing of a micro hot runner module

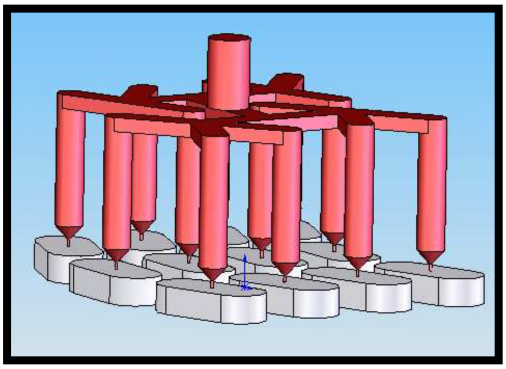
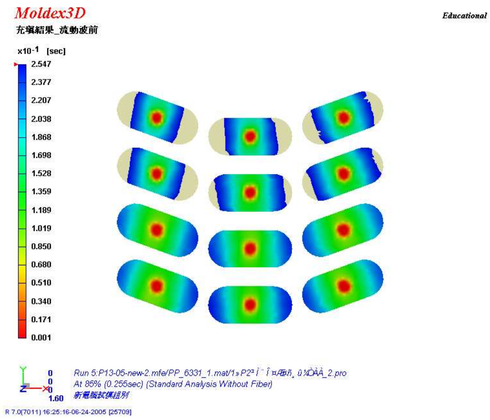


Fig. 2 Traditional cold runner system

Fig. 3 Micro tubes for the micro hot runner module



4(a) Moldex-3D simulation

4 (b) experiment

Fig. 4 Better flow balance design for molding the keypads of mobile phones by applying the micro hot runner module