Injection Moulding Pilot Production: Performance Assessment of Tooling Process Chains Based on Tool Inserts Made from Brass and A 3d Printed Photopolymer - DTU Orbit (25/12/2018)

Additive Manufacturing is becoming a viable option for the production of injection molding inserts in pilot production settings. This work compares an insert made from brass using conventional machining with an insert made from a proprietary photopolymer using Digital Light Processing (DLP) through the application of precision injection molding. The performance of the inserts is analyzed focusing on design, metrological aspects, tool lifetime, and thermal performance. In the experiment, a disk-shape geometry (diameter 41.5 mm, thickness 3.5 mm) was injection molded in Low-Density Polyethylene in a two-cavity mold. The inserts as well as selected injection molded parts were analyzed with an optical 3D micro-coordinate measuring machine. It was found that additive manufacturing technology can lead to a significantly more cost effective pilot production, both in terms of development time and investment. DLP technology enables fast production of micro-features, however insert production with DLP is less reliable than milling e.g. when considering process repeatability. Photopolymer and brass inserts lead to differences in optical surface appearance on the injection molded parts. The lifetime of the photopolymer inserts is challenging to predict reliably. Depending on how many parts need to be produced, the use of several photopolymer inserts instead of one brass insert is a means to overcome the shorter lifetime and can represent a cost-effective alternative to machined inserts. In order to exploit the advantages of using additive manufactured injection mold inserts, specific tool design rules have to be applied.

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