Evaluation of the performance of micromoulding blocks using micromanufacturing technologies

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Abstract

The production of micromoulding blocks for the mass production of plastic microparts is associated to the decision of the more adequate micromanufacturing technology for the quickest time to moulding operation. The integration of subtractive and additive micro manufacturing technologies and micromoulding techniques made the development of plastics microcomponents in several domains of activity possible at feasible costs. However, the lifetime expectancy of their replication tools is directly dependent on the tool material properties and the thermal and mechanical characteristics of moulding process. Besides the tool manufacturing costs, post-treatments to achieve the enhancement of tool properties as surface roughness or abrasion resistance must also be considered, so that the mass production process results technically and economically effective. Thus, a trade-off is required to establish the break-even point between the overall tool cost and the tool lifetime. An analysis was made on the design of plastics microparts considering their performance requirements and implications on the tooling manufacturing route and expected production life. It was considered the use of additive and subtractive technologies for the microtooling manufacture using current industrial equipment. This study enabled a possible approach using the Analytical Hierarchical Process (AHP) towards the detailed analysis of the life cycle and production costs of common routes in microinjection moulding. A study of this type requires the continuous update of micromanufacturing technological developments in order to score actual process features. This analytical hierarchization approach enables decision makers to input market requirements and to obtain suitable manufacturing solutions, considering the continuous technological challenges and economical aspects.

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