SL 7.19

Setting up the Operating Window in Injection Moulding: Application of Multi-Objective Evolutionary Algorithms

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The computational simulations of the injection moulding process are an extremely useful tool to define adequately the processing windows for the production of engineering thermoplastics components of quality. Generally, this is an iterative procedure requiring the analysis of multiple outputs (pressures, temperatures, shear stresses profiles) supported by pre-established decision criteria. Most of the cases the taken options may lead to opposed results. In this sense the development of optimization methodologies are of paramount importance in order to facilitate the definition of processing windows in injection moulding.
Simultaneously, the use of commercially available modelling software's, such as CMOLD, allows us to predict the process response to the operating conditions defined. These codes can be used to define better injection conditions to use in specific situations, *i.e.*, to optimize the process. Nevertheless, the absence of a global optimization methodology is evident, since this is only done using a trial-and-error procedure where the injection moulding conditions are changed until they meet the desirable performance.
In this work is proposed the use of an automatic optimization methodology based on Multi-Objective Evolutionary Algorithms (EMOA). For that purpose an EMOA is linked to an injection moulding modelling code, CMOLD. This allows the optimization of the processing conditions for a desired process performance, where criteria, such as pressure and temperature distributions, critical shear stress and strain and contraction, are taken into account.