# Evolutionary Algorithms based Optimization of Filling Process in LCM

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## ABSTRACT

Liquid composite molding (LCM) processes are efficient means for producing fiber-reinforced composite structures. Finding an optimal process configuration is usually the product of a long-term, expensive trial-and-error method. Reliable process simulation tools might contribute to significantly reduce production time, costs and risks. Simulation of LCM processes has been implemented in the in-house developed Finite Elements toolbox “FELyX” in 2D, 2.5D and 3D. A Finite Element mesh with triangle respective tetrahedral elements is used. The program is capable to be coupled to Evolutionary Algorithms. Evolutionary Algorithms are efficient methods for multi-parameter optimization. They have been successfully tested in structural optimization. The coupling to LCM simulation is a quite new field of interests. Applying this, the LCM process configurations for manufacturing any arbitrary structural part will be optimized. Objective functions are the laminate's quality (no air entrapments) on one hand and a short filling time on the other hand. Opimization variables are the gate and vent locations as well as injection pressures and timing. Based on an experiment, optimization is performed on a complex 2D-part. The original configurations are intuitionally set "by hand". The opimization algorithm is applied to this problem. The obtained gate locations and injection pressures remarkably improve the filling process compared to the original configurations.