

54<sup>th</sup> CIRP Conference on Manufacturing Systems

## Structural optimization of additively manufactured polymer tools for flexible sheet metal forming

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### Abstract

Traditionally, dies are subtractively manufactured for sheet metal forming. Beside the forming process, high tooling costs, material exertion and energy consumption of the die production offers chances for economic improvements. Especially, product(ion) individualization and small batch series require sustainable low-cost tooling approaches, where advances in additive manufacturing (AM) have recently led to additive tooling approaches. In this work, sheet metal forming tools are structurally optimized and 3D printed from bio-based polymers to reduce the overall material effort. The deformation and wearing behavior of the optimized tool is investigated during a drawing operation for low batch size of an automotive typical sheet material and compared to a solid AM-die approach as well as a tool made by conventional subtractive manufacturing.

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Peer-review under responsibility of the scientific committee of the 54<sup>th</sup> CIRP Conference on Manufacturing System

*Keywords:* additive tooling; additive manufacturing; structural optimization; sheet metal forming; rapid prototyping

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