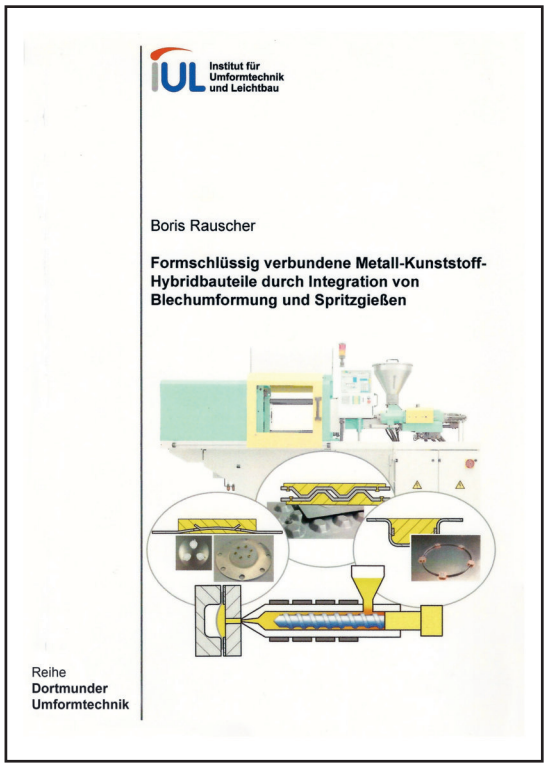
English version below

Institut für Umformtechnik und Leichtbau

Formschlüssig verbundene Metall-Kunststoff-Hybridbauteile durch Integration von Blechumformung und Spritzgießen

Boris Rauscher



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Zusammenfassung

This thesis presents a fundamental investigation on the manufacturing of positive-locking metal-plastic hybrid components by polymer injection forming (PIF). PIF is a process which beneficially combines working–media-based sheet metal forming and injection moulding in order to produce light metal-plastic parts with a high number of functions. The polymer which is used as pressure medium in the molten state to form geometrical features in the sheet metal remains as a functional part in the final hybrid structure. Contrarily to the established technologies for producing hybrid metal-plastic components, e.g. insert, outsert and hybrid technology, the new forming process PIF offers a short and efficient process chain since the sheet metal is formed within the injection mold.

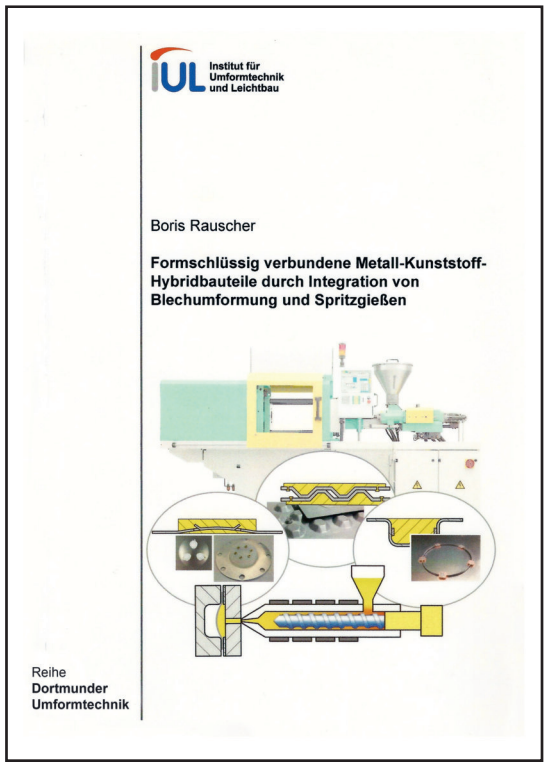
In this thesis, the PIF process is applied within an innovative process chain using semifinished metal sheets which can be adapted according to the requirement specifications of the hybrid part. The first focus in this thesis is on the application of semi-finished sheets featuring cuttings and perforations in order to ensure high-strength positive-locking joints between the metal and the plastic component in the hybrid part. Due to the hydrostatic pressure of the injected polymer melt, the shape of the metal component is formed as well as geometrical details depending on the geometry of the cut sheet sections. For each type of hybrid part, cylindrical as well as flat geometry, process limits have been identified applying experimental and numerical methods.

Secondly the applicability of geometrically structured semi-finished sheet metal for the manufacturing of metal-plastic hybrid parts by PIF is investigated. Applying a commercially established soldering process, patchwork elements were applied to the sheet metal serving as positive-locking joints in the hybrid part. Besides developing suitable patchwork blanks, the process limits for the forming process of the metal component as well as for the manufacturing of hybrid parts have been identified applying experimental and numerical methods. Finally, the properties of the polymer-metal hybrid parts have been identified with regard to the forming result of the metal component as well as to functional properties. The thesis closes with an outlook to promising process variants in order to further increase the process efficiency.

Institut für Umformtechnik und Leichtbau

Positive-locking metal-plastic hybrid components by integration of sheet metal forming and injection molding

Boris Rauscher



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