Stringer Sheets

Tailored Stringer Sheet Forming

Coordinator	Simon Biffar M. Sc.
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Department	Functional and Composite Structures
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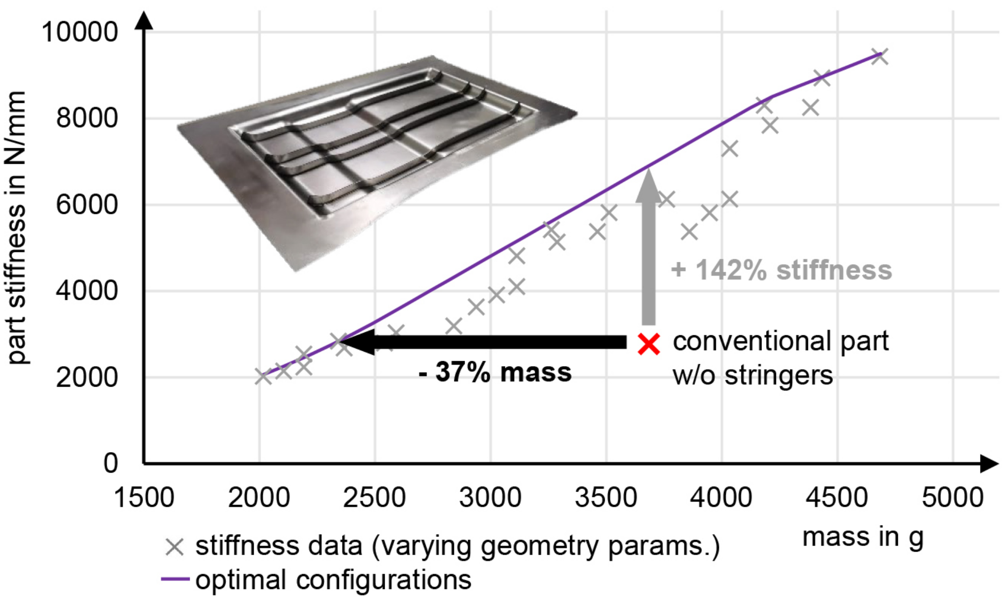
Abstract
Stringer sheet forming as an innovative lightweight construction strategy has already been extensively researched on the process side at PtU. In this project, the relationships between process and semi-finished goods parameters on the one hand and product properties on the other were demonstrated and a methodology for the requirement-based, mass-optimised design of stringer sheet components was developed.

Project description
Stringer sheets show great potential for providing efficient strategies for increasing the lightweight construction quality of sheet metal structural components through customised product design. While previous projects focused in particular on the development, improvement and feasibility of the process chain under industrial conditions, the project that has now been completed was able to finally achieve the practical applicability of the stringer sheet construction method in terms of a consistent design methodology for requirement-based component design while optimising the component mass.

Results
To clarify fundamental relationships, the first step was to experimentally determine the interactions between various influencing variables from the process and semi-finished product geometry on the one hand and the component properties of formability, stiffness, structural integrity, energy absorption, vibration behaviour and surface quality on the other. Since conventional modelling strategies of the finite element method, which is eminently important for component design in an industrial context, are not applicable due to the bifurcation of the part due to the stringer, a modelling strategy which employs meshing with continuum shell elements was determined to be particularly suitable for practical use after comparing several approaches. Based on the experimental and simulative investigations, a method for property-based design with optimisation of the component mass was developed and tested on an application-oriented demonstrator [1], which is based on the battery box lid of an electric vehicle. By using the method in the design process, 37% of the component mass could be saved as shown, while at the same time achieving the same stiffness as a conventional component. Alternatively, the stiffness can be increased by 142% with the same component mass.



[1] Demonstrator part battery housing

Institute for Production Engineering and Forming Machines – PtU
Prof. Dr.-Ing. Dipl.-Wirtsch.-Ing. Peter Groche | info@ptu.tu-darmstadt.de

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Network

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