SFB666 | T7

Stringer Sheet Forming for Car Body Construction

Editor	Dr.-Ing. Stefan Köhler
Duration	January 2018 – February 2020
Department	Functional and Composite Structures
Funded by	DFG

Abstract

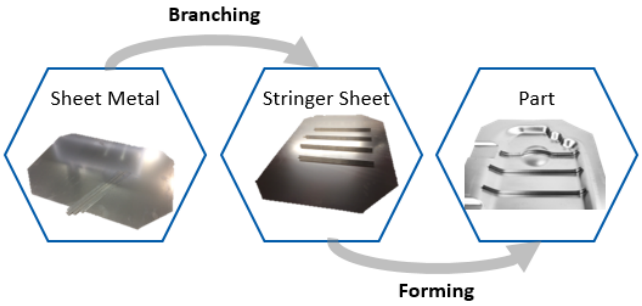
The transfer project T7 aims at implementing the scientific results of the last years in a prototype close to industry together with the application partner, the LÄPPLE AG. The selected component, an abstracted underrun protection of a passenger car, was equipped with stringers before being deep-drawn. A laser-welding unit and a forming tool were developed for the industrial implementation of the process chain. By locally increasing the area moment of inertia, the component was significantly stiffened so that the required static and dynamic stiffness of the component could be achieved even with 23 percent less material. In addition, the excellent cost-effectiveness of the process was demonstrated.

Project description

In lightweight construction, flat structures are branched to increase their stiffness while maintaining almost the same mass. Scarcer fossil resources and a growing environmental awareness make the cost-efficient production of such structures the focus of scientific research. Therefore, the process chain of stringer sheet forming was developed at the PtU. Prior to forming, the blanks are equipped with stringers by means of laser welding, which have a significant stiffening effect on the resulting component, which in turn enables material savings. After many years of intensive research, during which this process chain was investigated in the laboratory, the transfer project T7 aimed at implementing the stringer sheet forming in an industrial environment with LÄPPLE AG.

Results

In order to fulfill this task, an industrial laser welding device and a corresponding forming tool were developed and manufactured. The components produced with these tools were examined for their characteristics, the abstracted prototype had a stiffness of up to 7300 N/mm. In parallel, simulations of the component were carried out and validated. It could be shown that a component with 20 mm high stringers and a real automotive geometry (i.e. not in the form of the abstracted prototype) can be reduced in sheet thickness by 0.8 mm while maintaining the same stiffness. In an economic feasibility study it was also shown that, depending on the number of units, costs of 0.69 € to 2.38 € per kilogram saved are incurred - a more than acceptable value for the automotive industry!



[1] Prozesskette der Stegblechumformung

Acknowledgement

The project was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) in terms of the Collaborative Research Centre CRC 805 “Integral Sheet Metal Design with Higher Order Bifurcations“. Special thanks to LÄPPLE AUTOMOTIVE for their technical support during the implementation.

Funded by

DFG

Project partner

LÄPPLE

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

PtU FORMING EXCELLENCE

TECHNISCHE UNIVERSITÄT DARMSTADT