

CRC 805 B2 – funding period 2

CRC 805 B2 – Production families at constant quality – funding period 2

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Duration January 2013 – December 2016
Department Process Chains and Forming Units
Funded by DFG

Abstract

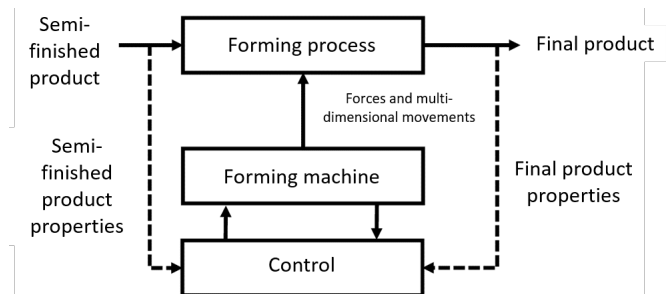
Forming processes are subject to inherent uncertainties that prevent the highly reliable production of workpieces. In the first funding phase of Collaborative Research Centre 805, the 3D servo press was developed, whose three degrees of freedom bring with them a previously unknown freedom of movement for the tool. The sub-project explored control engineering approaches to exploit the resulting potential and designed a multi-stage process chain, which was used to demonstrate approaches to controlling product properties.

Project description

The central subject of the sub-project is the control of uncertainty in forming processes with particular regard to fluctuations in demand and in semi-finished product properties. The core objective of the sub-project is to control these uncertainties by increasing the flexibility and adaptability of forming processes and process chains. With the development of the 3D servo press and its three degrees of freedom, there is potential for (real-time) control of product properties on the one hand, and challenges in process modelling and tool design on the other, which were systematically explored in the sub-project.

Results

The sub-project developed methods and processes for controlling and regulating product properties on the 3D servo press. For example, a learning control system was developed for free bending that compensates for the semi-finished product-dependent springback behaviour. By measuring process variables close to the product, it was also possible to control uncertainties in the component flow limits and precisely predict springback. In addition, a flexible multi-stage stamping and bending process was developed and a tool design method was devised for it. In this way, it was possible to obtain information on the product side in the stamping stage via measurements of sheet thickness and stamping force and, with the help of these, to adjust the parameters of the bending process in such a way that quality-appropriate end products were manufactured.



[1] Approach for closed-loop control of product properties in forming technology

Acknowledgement

We would like to thank the German Research Foundation (DFG) for funding the presented projects within the framework of the Collaborative Research Centre SFB 805 „Control of Uncertainty in Load-Bearing Systems of Mechanical Engineering“.

Funded by



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