Chair of Metal Forming and Casting (*utg*)
Department of Mechanical Engineering
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Freeform bending

Methodology for the design of freeform bending tools for square profiles

Motivation

The freeform bending technology offers a lot of potential for the development of complex bending parts. Therefore, tubes as well as open or closed profiles can be used. Currently, common inefficient trial-and-error procedures with numerous iterations are used for designing and manufacturing freeform bending parts.

This elaborate and expensive procedure is to be replaced by defined methodologies based on exact knowledge of the process and the materials. This allows the manufacturability to be evaluated as early as the development stage, which saves time, money and resources.

Approach

First, the cause-effect chains are investigated. Therefore, process parameters and tools are researched regarding their interactions. Simulation models, a test bench and a freeform bending machine by J. Neu GmbH provide the possibilities to do so at the *utg*. Figure 1 shows the bending machine at the *utg*.

Fig. 1 J.Neu GmbH freeform bending machine NSB090

Figure 2 shows the simulation model for the freeform bending of a rectangular shaped tube using LS DYNA.

Fig. 2 Simulation model of a rectangular tube

Based on the investigations on the cause-effect chains, the methodologies for tool development and process setup are defined. Using a demonstrator part, the new methodology will be validated and verified. Therefor, a new set of tools will be designed, containing the improved movable die, the mandrel and the improved holding die.

Summary

The developed methodology is based on the knowledge about the process, the cause-effect chains and the material behaviour. It consists of three parts as shown in Fig. 3. First, a part is designed as a digital model. Second, a tool analyses the part regarding manufacturability and a feedback is given. Third, the specifications for the setup of the machine and the development of the suitable set of tools are given.

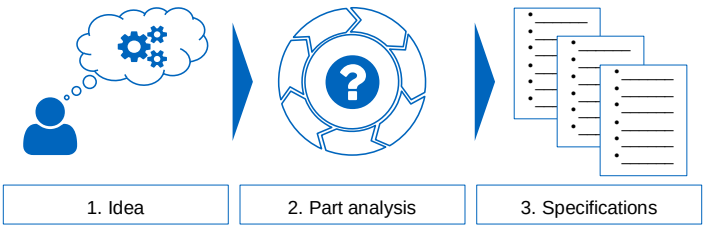

Fig. 3 Methodology for the tool development

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