1.7 FEM Simulation of the forming of parts from thick sheet

H.H. Wisselink

Cluster 1. Modelling of forming of metal and laminate products, project MC1.98056
University of Twente, Applied Mechanics
P.O. Box 217, 7500 AE Enschede, The Netherlands

Netherlands Institute *for* Metals Research

Introduction

According the projectplan the forming of a thick sheet metal part typical for DAF will be investigated. The batteryboxbracket (Figure 1) has been chosen, which is already over ten years in production and proved to be critical. This part is fixed with bolts to the chassis of the truck and supports the batterybox (Figure 2). The initial thickness of the blank is 5mm. The length of the part and the hole pattern can change, depending on the trucktype.

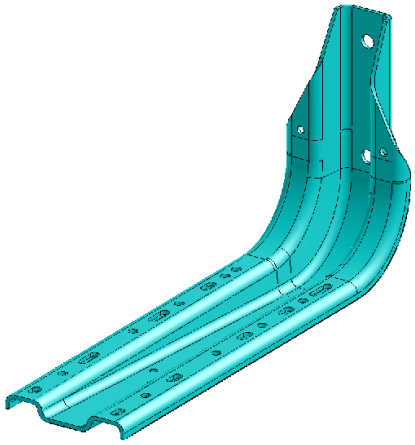

Figure 1: BatteryBoxBracket.

The production process consists of 5 steps. First the flat blank is bended ($\pm$ 90 deg.). Next the part is drawn in two stages. Afterwards the holes are punched in two steps. All steps are performed in one press stroke.

Figure 2: Truck with batterybox.

Objectives

The first three production steps of the batteryboxbracket will be investigated using FEM simulations. This will give more insight in the drawing of this and similar parts, which can lead to an improved processdesign. Furthermore the consequences of the introduction of high strength steels can be studied.

Results

The tools have been created from paper-drawings in a suitable format for FEM simulations (These tools were designed before the CAD era). Luckily the tools are relatively simple and symmetric.
Some first simulations have been performed using the shell elements of DiekA to check the tools and to get familiar with the specific process (Figure 3).

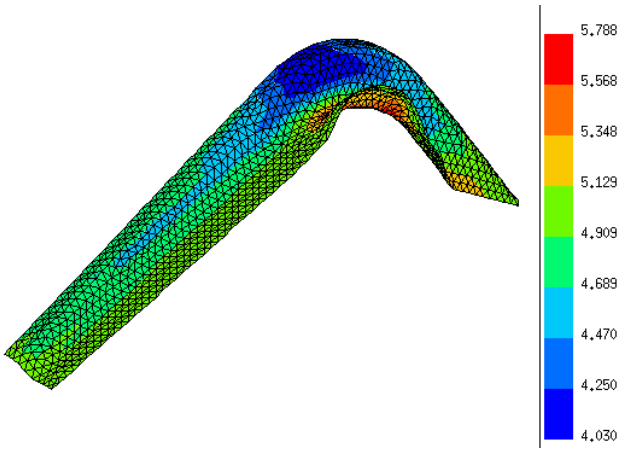

Figure 3: Thickness after first draw [mm].

Future work

The radii of the tools used for the drawing of this part are 8 and 10 mm, which is of the same order as the sheet thickness. Therefore it has to be investigated whether the assumptions commonly used for simulations of thin sheet are still valid. Can shell elements, which take into account the membrane and bending stiffness and neglect transverse shear, still be used or are solid elements necessary? Furthermore the simulation results have to be validated.

University of Twente
The Netherlands

Contact info:
h.h.wisselink@ctw.utwente.nl

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