Introduction

Finite element software is used in the design process of new sheet metal parts (see figure 1). During the process the amount of springback (elastically-driven change of product shape) is numerically predicted. This information, being used in tools design phase, ensures that the desired product shape will be reached.

Current accuracy of numerical prediction of springback is insufficient. Required surfaces of tools can only be obtained after employing the extensive experimental trial and error process.

Objective

The major goal of the project is to improve the numerical predictability of springback to meet industrial requirements.

Methods

Springback guidelines. Four characteristic components were chosen to study the sensitivity of springback to various parameters. In addition a literature study of this physical phenomenon was performed. The results of the sensitivity analysis and the literature study will be transformed into guidelines for accurate springback prediction (see figure 2).

Results

To reach a sufficient level of accuracy of springback prediction the attention must be given to:

- the element size, the element type and the amount of integration points through the thickness;
- the unloading method. Physical springback may not be entirely elastic and hence the method of numerical unloading should emulate the real tools retraction;
- the selected material model. Accurate description of the elastic-plastic anisotropy, variation of material elastic modulus and the Bauschinger effect is required (see figure 3).

Future work

Some of the described factors will be considered and improved numerical algorithms will then be developed and tested.

References