

## 6. Freiburger Kalibreurstag

### Topic: Groove Pass Design of Asymmetric Profiles

Date 28./29.08.2024  
Place Institut für Metallformung (TU Bergakademie Freiberg)  
Bernhard-v.-Cotta-Straße 4  
09599 Freiberg

### Wednesday, 28.08.2024

- 13.00h Welcome and introduction of the participants
- 13.45h Keynote speech: Methodical conclusions from design examples of symmetrical and asymmetrical profile groove pass designs for two- and multi-roll stands
- Differences and similarities of groove pass designs for 2, 3, 4 and universal roll stands will be analysed. Relevant mechanisms that influence the stock flow in the grooves are worked out together using selected sample layouts. The dependencies of expansion, compression and stretching on relevant process variables are explained. Typical problems such as cross flow, direct and indirect pressure, mould filling and the stretching wheel distribution of asymmetrical profiles are discussed.
- 14.45h Coffee break
- 15.00h *Investigation of basic mechanisms and design criteria for material flow in asymmetric profiles I*
- We start with the Python and PyRoLL basics required for the calculation to read in and out given profiles from different file formats and the preparation for the subsequent groove design. The influence of the flank inclination on the material flow is discussed on the basis of the compression between straight and inclined webs. Based on this, the influence of gripping conditions in the longitudinal and transverse direction on the pathline of the material flow will be analysed. Methods for calculating the working diameter will be practised using more complex special profiles
- 15.30h Coffee break
- 15.45h *Investigation of basic mechanisms and design criteria for material flow in asymmetric profiles II*
- For unevenly compressed profiles, the influence of the degree of elongation distribution (Lendl, Neumann) and the resulting mean degree of elongation with its effect on the groove filling will be discussed and practised. In particular, the difference in irregular forming for more compact and elongated profiles will be discussed. Asymmetrical moulding passes tend to torsion of the profiles. A moment analysis based on Krautmacher's method is discussed. The differences between forming in closed and open flanges will also be discussed in detail. The recommendations developed for mass redistribution will be explained using the goblet iron groove.
- 16.15h Coffee break
- 16.30h *New developments in PyRoLL 2.XX: An introduction to the stich pass calculation and practical exercise with the open source project PyRoLL*
- This course introduces current innovations in the PyRoLL project and explains its use for quasi-asymmetric calculations.
- 18.00h Evening Event

## Thursday, 29.08.2023

- 08.00h *Design of symmetrical and asymmetrical cutting grooves for mass redistribution in the first forming passes*
- Based on symmetrical and asymmetrical forming passes, the design of cutting grooves for generating very different mass distributions in the cross-section through to the separation of individual cores is discussed and the calculation and grooves design practised. The resulting local degree of deformation distribution is of particular interest for cold forming, as these are often retained up to the final forming groove.
- 09.00h Coffee break
- 09.15h *The quintessence of the design methods for flange profiles and their application to similar special profiles*
- Using the methodology for groove pass design for T-, L- and H-shaped grooves, the basics will be developed and the adaptation of the design methodology for steel window profiles from L-pass designs will be demonstrated in an exercise example. Examples of exercises for F and Z profiles will round off the discussion. In particular, the differences and possibilities of cold forming by profile drawing or profile rolling will be discussed.
- 10.45h Coffee break
- 11.00h *Goblet and rail groove pass design exercise ... The difference between two-roller and four-roller groove pass designs and the use of beam blanks*
- The procedure for very different surface distributions in the cross-section will be discussed using the cup and rail pass design. Two-roller and four-roller systems offer different options for groove design. The advantage of using beam blanks will be demonstrated using the rail grooves.
- 12.00h Lunch
- 13.30h *Exercise example: Groove pass design of the sole shoe and sewing machine foot*
- Using the selected grooves, the participants are to independently design a groove using what they have learned with assistance. Important points of the design process are discussed together.
- 14.30h Coffee break
- 14.45h *An exercise example: What changes in the pass designs when the microstructure development during hot rolling of asymmetrical profiles is included in the design?*
- Degree of deformation distribution, forming speed and temperature influence the local microstructure development. Selected examples will be used to illustrate the difference in the achievable pass sequence when the requirements for final mechanical properties and microstructure restrict the purely geometric-mechanical design.
- 16.00h Strategy discussion on the International Centre for Groove Pass Design with presentation of certificates (summary, status report, topics for the coming year)
- 17.00h Conclusion

**Afterwards on Friday, 30.08.: PyRoLL user meeting**