Comprehensive Correlation of Seat Track Assembly - From Forming to Assembly Test -

S. Sinne, H. Klose, V. J. Dura Brisa, P. Partheymüller

Brose Fahrzeugteile GmbH & Co. Kommanditgesellschaft, Coburg

1 Motivation

The dimensioning of seat structure including its adjusting components is always a challenge between comfort, lightweight and strength. The main interface between seat structure and vehicle is the seat track assembly. It enables the length adjustment and transfers a significant amount of the crash load. The increased demands to lightweight, reduction of development time and cost efficiency require a continuous improvement of simulation models regarding accuracy in predictability.

Objective of the presentation is to illustrate a comprehensive correlation approach of simulation and test in order to achieve a high accuracy in strength assessment for seat track assemblies under crash load.

2 Correlation approach

Due to the high number of influencing factors on seat track assembly strength a comprehensive and step-wise correlation approach is applied.

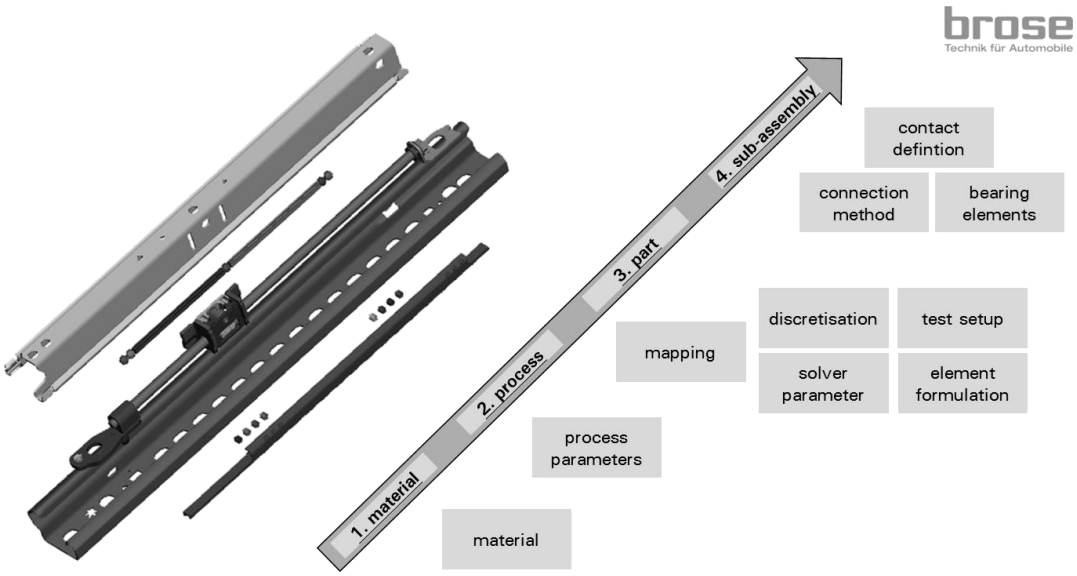

Fig.1: Influencing factors and overview of correlation approach (greyscale).

1. Characterization of track material is the basis for the simulation of sheet metal forming as well as crash analysis. For this purpose the enhanced material model MFGenYld from MATFEM is used.
2. The accuracy of the sheet metal forming (process) is investigated and improved regarding geometry and local cold hardening.
3. On part level, the quality of material model in combination with process history is verified under three-point bending loading for upper and lower track. To assess the accuracy of the simulation model reproducible test results for large deformation under high speed loading are necessary. Thus, a special test rig was developed. An important feature is the continuous measurement of part and test rig deformation using digital image correlation (GOM-PONTOS).
4. On assembly level, load cases equivalent to crash were investigated similar to part level.

3 Results

Due to the testing approach highly reproducible result on part and assembly level are achieved, allowing a quantitative assessment of correlation. Starting from a 5 mm and standard MAT24 material improvements in simulation model were investigated.

3.1 Part level – 3-Point-Bending

Material modelling, mesh refinement and forming simulation lead to a significant improvement of accuracy in simulation results compared to reference modelling for upper and lower track.

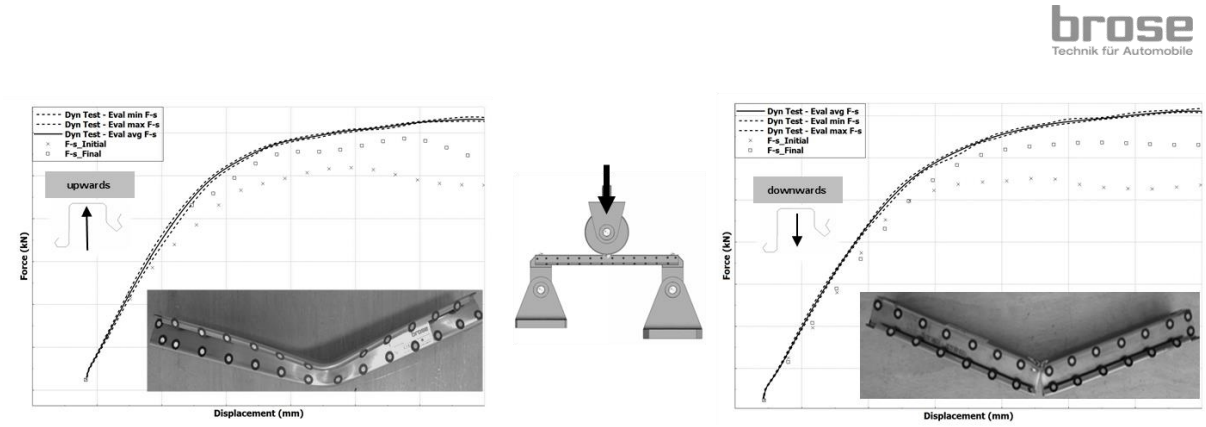

Fig.2: upper track under three point bending

3.2 Assembly level

Based on part level simulation model for tracks, assembly specific modelling techniques for interaction of tracks and internal parts (e.g. bearing) were investigated.

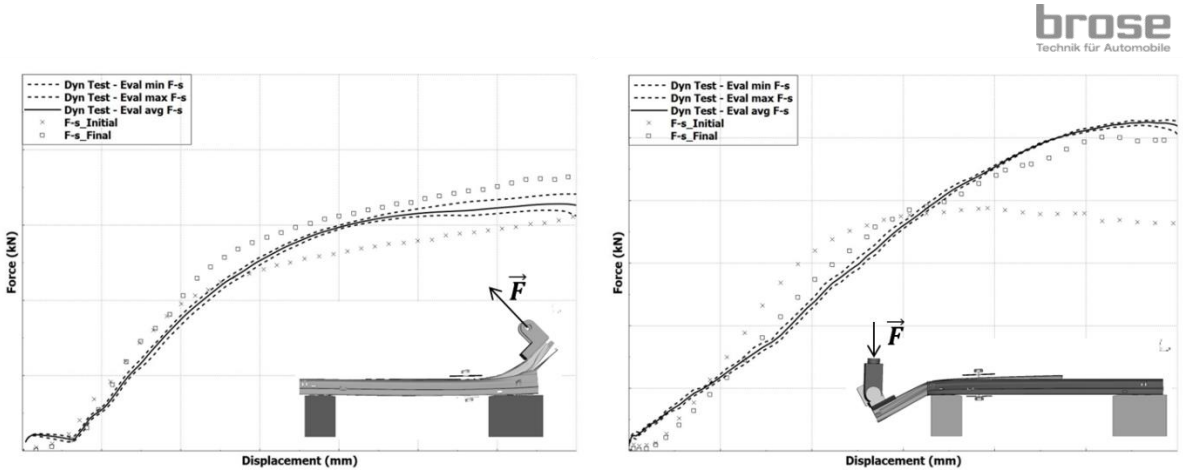

Fig.3: sub-assembly in component test

4 Summary and conclusion

The presentation shows a comprehensive correlation approach allowing a quantitative assessment of correlation for seat track assembly under crash loading. Focus on these investigations was high predictability of strength using industrial available simulation and testing capabilities. The correlation approach is transferable to other part and sub-assemblies.