Analysis of the Forming Limit Diagram in Digital Environment

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Abstract. The determination of the forming limit diagrams (FLDs) for sheet metal can be influenced by testing parameters and a chosen testing procedure. Many different tests have been applied and recent work has resulted in some guidelines to decrease the influence of the testing method and the expertise of an individual laboratory. In the last years some methods have been developed which tend to be independent from the individual expertise, but comprehensive experimental work is still indispensable to obtain the material's necking and failure limit.

The experimental work could be omitted by prediction of the FLD with numerical simulations. The paper presents a methodology to determine the whole area of the FLD for sheet metal in a digital environment. The material thinning has been analysed with the finite element simulation using the ABAQUS program. The Marciniak testing procedure has been chosen to determine the FLD. The thickness strain as a function of time as well as first and second time derivation of the thickness strain have been analysed for the critical specimen areas where the onset and propagation of necking occur.