

Studies on the influence of embossing on the mechanical properties of high-strength sheet metal

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Abstract. In sheet metal forming, the embossing technique can be a method to strengthen sheet metal materials. The increase in strength is thereby achieved by strain hardening and residual stresses induced as a result of the embossing process, which locally influence the mechanical properties of the sheet metal blanks such as yield and tensile stress. Through specifically inducing these effects, the process window in a deep drawing process can be enlarged and the operating performance of sheet metal components under quasi-static and cyclic loading can be significantly improved. In particular, this relates to the fatigue strength and characteristics of these components under different operating conditions. In the study presented in this paper, dual-phase DP600 grade steel sheets having a thickness of 1.2 mm were subjected to near-surface unilateral embossing. Here the influence of different embossing patterns and embossing depths on the stresses and strains acting in the sheet metal was investigated. In order to evaluate the effects of the focused embossing parameters on the increase or decrease of mechanical properties, forming behavior and influence of locally induced residual stresses, tensile tests were conducted with embossed sheet specimens. An essential finding of this study is that the increase in yield strength is significantly dependent on the distances between individual embossings, but regardless of this, the tensile strength remains at the same level.