Active Material Flow Control During High-Pressure Sheet Metal Forming

P. Groche[a] and Christoph Metz[b]

Institute for Production Engineering and Forming Machines, Darmstadt University of Technology, Petersenstr. 30, D-64287 Darmstadt, Germany

[a]groche@ptu.tu-darmstadt.de, [b]metz@ptu.tu-darmstadt.de

Keywords: production process, sheet metal forming, material flow control

Abstract. During forming of non-rotationally symmetric sheet metal parts at high pressures non-uniform deformation conditions arise in the flange area. These deformations vary in height and consequently lead to heterogeneous sheet thickness distributions. When using semi-rigid tools, high clamping forces are necessary in order to compensate for the developing sheet thickness variations in the flange area and to avoid leakages of the system or wrinkling. Moreover, the heterogeneous distribution of the clamping force is strengthened by press inaccuracies. This results in a higher surface pressure distribution on one side of the flange and finally in a non-uniform material flow out of the flange area. The development of a segmented active-elastic blank holder enables an active material flow control of the flange movement during sheet metal forming at high pressures. The local elasticity of the active-elastic blank holder is based on an optimized layout of the local tool rigidity. For this purpose, different grooves were integrated below the blank holder surface. This paper provides an overview of the developed technology, advantages with regard to the part's quality, and recent results comparing the production of non-rotationally symmetric parts with segmented active-elastic tools vs. semi-rigid tools.