Improvement of Formability in Tube Hydroforming by Reduction of Friction with a High Viscous Fluid Flow

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Abstract. Tube hydroforming is an advanced technology for the manufacturing of lightweight components with complex shape. The forming results can be usually improved if axial feeding at the tube ends is enabled. For very long parts, however, due to the high friction forces acting at high pressure in the feeding zone between tube and die, no material movement towards the expansion area occurs. The tube is only upset in the feeding zone, no compressive stresses take place in the expansion area and the forming results are not satisfactory. This can be avoided by eliminating friction and by inducing additional tangential stresses in axial direction on the tube surface of the feeding area. This paper presents the investigations performed in this direction by using a high viscous fluid flowing along the internal and external surface of the tube. The flow helps to reduce the friction force and allows the sliding between the tube and the tool surface. Experimental tests of tube upsetting under pressure will show the effects of the medium flow on the thickening of the tube wall. Not only increased sliding and homogeneous thickening will be obtained, but even an increase of the wall thickness in the area close to the expansion zone will be shown. This effect is even stronger when the yield stress in the expansion zone is reduced by means of a previous local heat treatment.