Closed-Loop-Control of the Material Flow in the Deep Drawing Process

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Abstract. In this paper, a concept of a closed-loop-control system for the material flow in deep drawing processes based on a fuzzy-controller is presented. The deep drawing process is influenced by different variables as batch dependent material values, machine parameters as well as variations in the forming tools. Process stability can be improved by continuous process monitoring and process control. The control loop for controlling the material flow consists of an optical sensor, a deep drawing tool with an elastic blank holder, a fuzzy controller and a deep drawing press with a multi point drawing cushion.

The controlled variable (material flow) was measured contact-free and on-line by means of an optical sensor developed at the IFUM. As control variable the different lokal blank holder forces were chosen in order to influence the material flow in different areas. In order to combine the controlled variable (material flow) and the control variable (lokal blank holder force) a fuzzy logic controller was designed.

The performance of the material flow control was investigated by generating disturbances (e.g. a high blank holder force at the beginning) in the deep drawing process. This procedure shows that the fuzzy-controlled material flow can be compensated for the disturbances by means of changing the blank holder force.