Roll Beading

Flexible roll beading - production of profiles with variable cross-section

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Abstract

In the context of the change from conventional mass production to mass customization, the „flexible roll beading“ process was developed, which allows the continuous production of profiles with variable heights. As part of the DFG project, a test facility was developed for experimental investigations. The finite element method was used to analyze process characteristics with regard to the stress and strain conditions acting during forming as well as critical failure cases.

Project description

Lightweight design calls for load-adapted material distribution in components, which requires the use of flexible manufacturing processes. Flexible roller beading expands the range of components in profile construction to include height-adjustable profiles. The functional principle and the actuator-controlled tool kinematics are shown in Figure 1. The required material for shaping the profile flows into the cross-section through lateral strip feeding, which prevents material thinning in the legs.

Results

The feasibility of flexible roll beading has been demonstrated numerically and experimentally. In the forming zone, characteristic stress conditions and displacements are observed in the flange resulting from the lateral strip pull-in. Since the strip is not drawn in purely in the transverse direction, but displacements also occur in the longitudinal direction, pressure areas arise in the flange which can lead to wrinkling. These longitudinal compressive stresses limit the process window in flexible roll beading.

Acknowledgement

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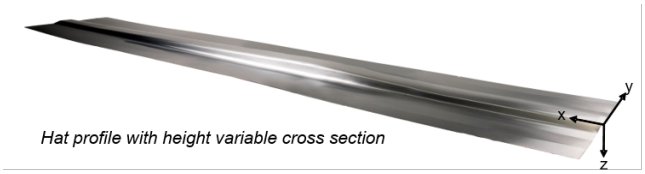
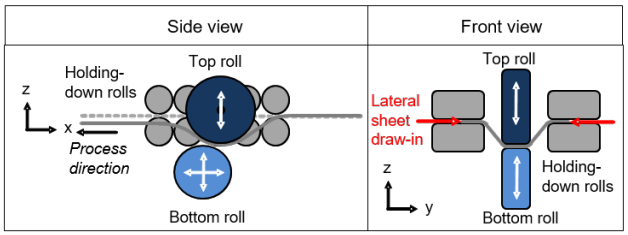
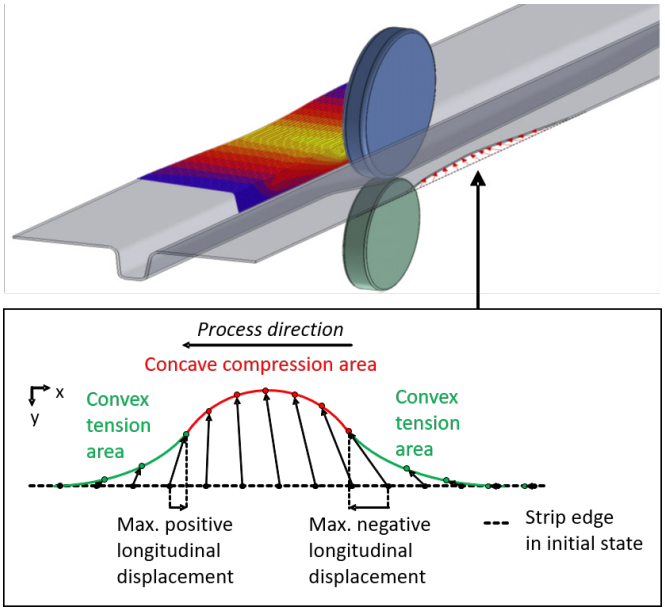




[1] Functional principle of flexible roller beading



[2] Characteristic stress and displacement in the flange of the forming zone

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