ON THE NUMERICAL SIMULATION OF TUBE SPINNING BY MEANS OF FEM USING AN INCREMENTAL QUASI-STATIONARY METHOD

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The tube spinning process is an incremental process, consisting of many repeated cycles, where the material is only local plastified in rather small and not strongly changing forming zone, that moves constantly with small speed along the axis of symmetry and quickly in circumferential direction relative to the material, but not in space coordinates. So it is advantageous to apply a quasi-stationary method. Many cycles follow one after another. The deformation process is in steps periodic or at least almost periodic. At the same time there is an hindrance of the material flow due to the not-plastified areas. This induces a complicated stress ratio, that demands better simulational methods and a constitutive law matching the material behaviour at incremental deformation.

By the numerical integration of the constitutive law the work hardening has to be taken into account by means of evolution equations for back-stresses with Oldroyd derivations and for the yield stress as a function of an equivalent strain. The rotation of the basis of the cylinder coordinate system is also considered, that is espesially important in the substantial derivative.

The integration of the constitutive law is to be implemented in the FEM programm, that covers one pass (120° in circumferential direction). The parameters of the constitutive law should be adjusted to the real process.

The algorithm will be presented, where the motion of the material points is followed in the net along streamlines and the motion in the circumferential direction is corrected during the iteration.

(3)

Literature

1. *Besdo, D.* Constitutive laws for metal forming purposes in stress- and in strain-space representation // FE-simulations of 3-D sheet metal forming processes in automotive industry, pp. , *VDI Berichte* **894**, 1991, VDI-Verlag, Düsseldorf