SEQUENCE INFLUENCE OF STRETCHING AND MOMENT APPLIEDS AT BENDING WITH STRETCHING CONCERNING PRECISION OF PIECES PRODUCED BY COLD PLASTIC DEFORMATION

Lucian V. Severin[1], Traian Lucian Severin[2]

[1,2,] *Stefan cel Mare University of Suceava, Faculty of Mechanical Engineering, Mechatronics and Management, Romania, e-mail: severin@fim.usv.ro, severin.traian@fim.usv.ro*

Abstract: *This paper presents a theoretical resolution of sequence influence the application of tension and bending moment concerning elastic recovery characteristics of pieces produced by cold plastic deformation. It was obtained calculus relations the bending moment plastic and elastic recovery characteristic quantities that influence the processing accuracy. Results obtained recommended bend workpices by bending with stretching process until to the yield strength of the material at stretching. Sequence application tension in relation to bending moment is not significant on precision processed parts, but it is advisable to apply stretching moment before to reduce the no uniformities deformation between due to friction between the workpiece and tool deformation.*

Keywords: *stress, bending with stretching, neutral stratus, elastically recovery characteristic.*

1. Introduction.

Plastic bending of a metal strip is generally characterized by the extent of the metal layers located in the convex zone and by the compression of the metal layers in concave zone located to the center of curvature. Between the stretched and compressed layers is situated neutral layer MN. (fig.1) [1].

Bending narrow strip of sheet with $b<3s$ occurs with increasing cross-sectional deformation. It consists in decreasing the thickness of the folded portion of the blank, widening to the curvature center and narrowing to the external zone. Bending wide bands with $b\geq 3s$ occurs with thinning of thickness and a very small widthwise sectional deformation due to increase resistance of material that opposes deformation [2].

The tensile stress and compressive on a section are separated from the *MN* neutral layer with ρ_n radius, moved to the center of curvature with the median layer ρ_m, whose position can be determined with the equation [3]:

$$\rho_n = \sqrt{R\,r} \tag{1}$$

For practical cases bending with $\frac{\rho_m}{s} > 5$ can be considered ρ_n to coincide with ρ_m [1]. For the bending relative radius $\frac{\rho_m}{s} > 200$, the tangential stress value σ_θ in a layer situated at a distance y from the middle layer ρ_m can be determined with the equation [3]:

$$\sigma_{\theta y} = \sigma_c + E_1 \frac{y}{\rho_m} \tag{2}$$

where: $\sigma_{\theta y}$ is the yield strength of the metal; y- current distance from the median layer; ρ_m - bending radius of the median layer; E_1- plasticity modulus what is determined with real linear cold hardening approximated characteristic, and have the value:

$$E_1 = \frac{2{,}1\,\sigma_c}{\varepsilon_g} \tag{3}$$

where ε_g is the specifically elongation at narrowing of section.

Bending moment of a strip with width equal to the unit can be determined by relation [3]: