THE INFLUENCEOF SHEAR CLEARANCE FROM ACTIVE ELEMENTS EDGES CONCERNING THE QUALITY OF CUT PIECES

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Abstract: *In the case of the tools for metallic materials cold trim, as a duration measure for assuring the adequate development of the technological process both the force plug or the matrix dimensional modifications measure are taken, but also the ridge height (the degree) which is determined by the tool wear degree.The fractures actually span through the area of tolerance from the edge of the punch to the edge of the die.The remaining two thirds of the stock thickness are called the breakoff. The upper surface is called the burnishing side, or punch side, and the bottom is the burr side. In every punching, piercing, or blanking operation, the burr side is always opposite the punch.*

Keywords: cutting,shear, clearance, effects

1.INTRODUCTION.

When the degree (ridge) overcomes a certain value (prescribed through the quality requirements of the processed pieces) the continuing use of the tool (therefore increasing its use duration) there is no longer admitted even if the technologic process may continue. The experiment proved that the ridge measure is directly proportional with the active elements wear.The ridge cutting is executed both by obtaining finite pieces, and through bar strips for later operations of deformation processing.

Blanking contains several procedures like: fret sawing, boring, corrugation, clipping, graduation, etc.

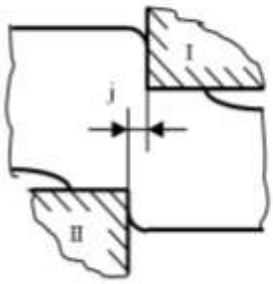

Fig. 1 The cold cutting process diagram of a metallic material into the cutting and bar stripping process:

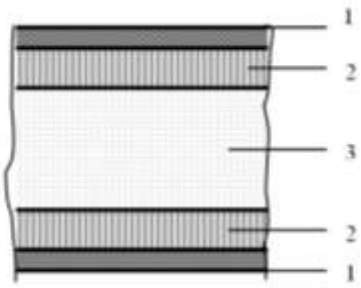

Fig. 2 Areas that appear in a cutting and bar stripping section

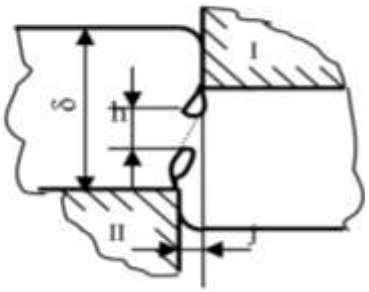

Fig. 3 Micro and macrocracks development mechanism
δ, blanking thickness

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The mechanism of the cutting and boring process is schematically presented in figure 1 it includes 3 characteristic phases:

- the request of the elastic state material , when combined efforts do not overcome the processed material flow limit: the cutting edges go into the material causing a slight

sheet curving within the limit of j slack between the two cutting edges I and II. Zone 1 (fig. 2) that corresponds to this phase, has a shiny aspect, without flowing lines.

- the request of the plastic state material, while combining efforts due to the cutting edge pressing, they overcome the processed material flow limit, that flows towards the direction of the mobile cutting element hauling direction (the knife or the scissors disk, perforating force plug). The zone aspect (2, fig. 2) is even, due to specific plastic flow.

- The breaking phase corresponding to the central portion which, by reducing itself while the cut edge enters the material, cannot take over the efforts caused by cutting edges pressing and it breaks. The surface aspect in this area (3, figure 2) is uneven, specific to breaking.

The material separation begins when the unitary efforts transmitted through the two cutting edges I and II (figure 1) creates plastic deformation areas on the material (section) thickness, which coalesces. When plastic flow is no longer possible in this area, microcracks and macrocracks begin to appear, and they propagate into the material on its thickness, favouring the breaking of the remained h section, (figure 3).

The thickness (height) in the area where macrocracks began to appear, the h zone, is the uneven aspect zone (zone 3 in figure 2) and represents "the ridge" or "the degree", characterizes through its height, evenness and the quality of the finished product surface, obtained by processing; the bigger this zone is, the least the evenness of the processed surface is and the lower the product quality.

2. SHEARCLEARANCEEFFECTS

The fractures actually span through the area of tolerance from the edge of the punch to the edge of the die. The final cut's edge looks like that pictured in Fig. 4 and Fig. 5 ware, notice the smooth, straight, circumferential band (A), usually about onethird of the total material thickness (t) with well-sharpened tooling.

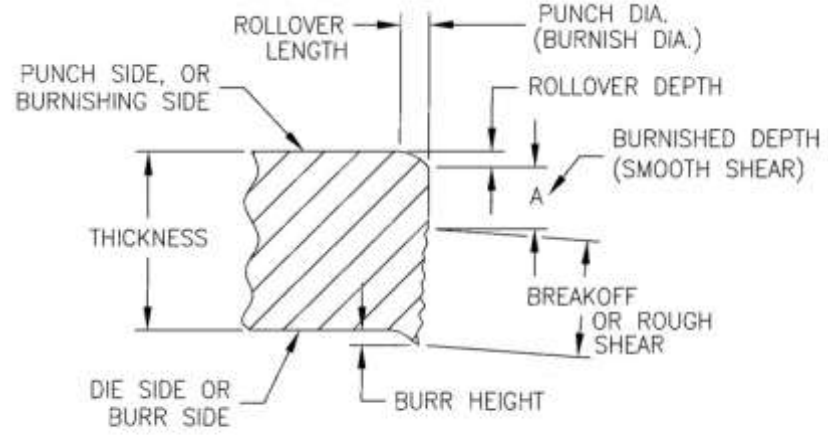

Fig.4 Detailed view of a pierced edge. (*Technical illustration is reprinted with permission from Dayton Progress Corp., Dayton, OH.*)

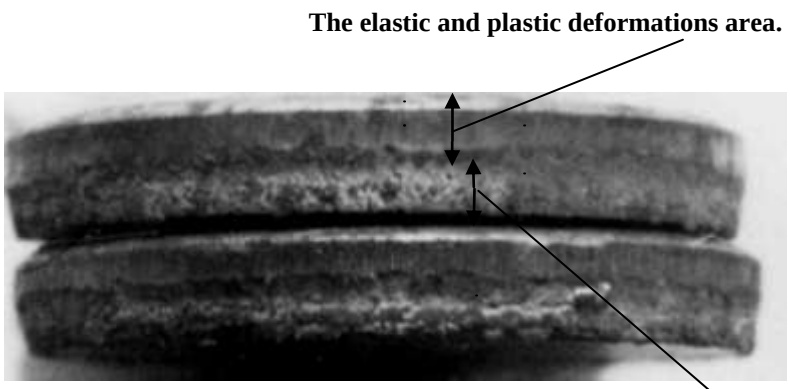

Fig.5. Improved 205Cr115 die 5X

The remaining twothirds of the stock thickness are called the breakoff. The upper surface is called theburnishing side, or punch side, and the bottom is the burr side.In every punching, piercing,or blanking operation, the burr side is always opposite the punch. [1]

Are presented in Tables 1 shear clearance effects.

Table 1 Shear Clearance Effects

	Shear clearance per side			
	5%	9%	12.5%	18%
Rollover length	0,34544	0,25654	0,30734	0,35052
Rollover depth	0,0762	0,0889	0,1143	0,14224
Burnish depth	0,5334	0,381	0,3556	0,381
Burr height	0,0127	0,01524	0,0127	0,03048

Test results above were recorded using 0,8mm. thick CRS, HRb =59 Punch diameter used: 5 mm. In the figures 6-9 there are displayed the graphical representation of the shear clearance effects, where the red line represents the polynomial approximation of graph where the red line represents the polynomial approximation of graph.

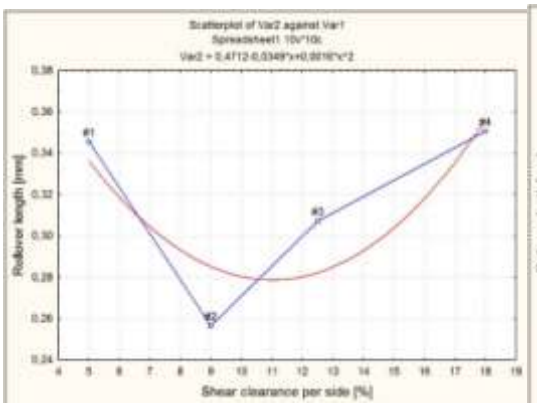

Fig. 6 Rollover length

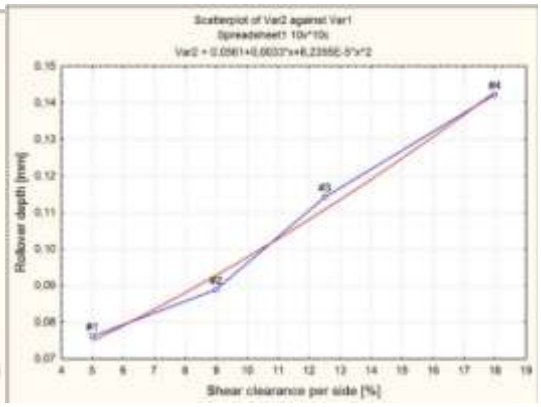

Fig.7 Rollover depth

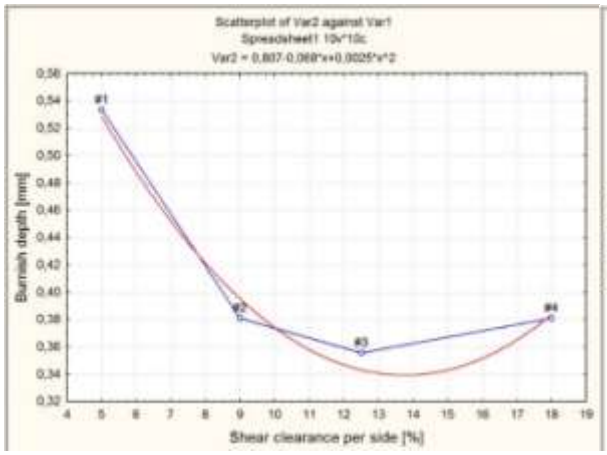

Fig.8 Burnish depth

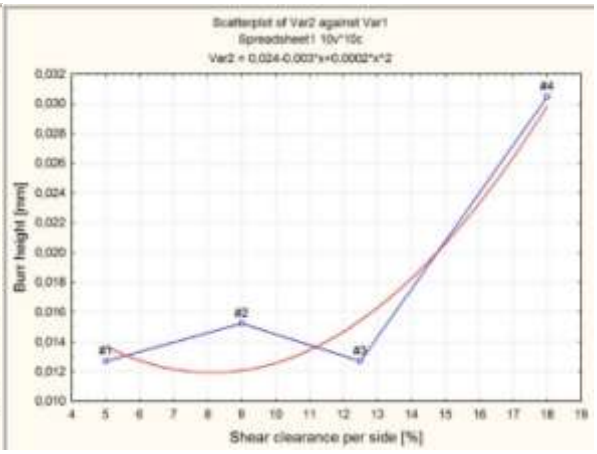

Fig.9 Burr height

3. CONCLUSIONS:

In the resulted section after cutting, we can observe an even, shiny area, specific to plastic deformation and an uneven area, typically for breaking.

From the figures above we can draw the following conclusions:

- Rollover lengthit is minimally around value of 9% shear clearance per side
- Rollover depthit is minimally around value of 5% shear clearance per side
- Burnish depthit is minimally around value of 12,5% shear clearance per side
- Burr heightit is minimally around value of 12,5% shear clearance per side

Usually, a 6 to 8 percent of the pierced materialthickness per side is recommended with ordinary tooling.

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