

## STATISTIC PROCESSING OF EXPERIMENTAL INFORMATION OBTAINED DURING STAMPING TECHNOLOGICAL OPERATIONS REGARDING DEVIATION FROM GEOMETRICAL FORM OF INSTRUMENTS (PART II)

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The paper is a continuation [1] to have a more concluding image of obtained results.

### 1. Analyze of the geometrical form of matrix

Pieces were oriented on prism, and with the aid of the comparison apparatus were gathered information that was processed with the program of diagrams STATISTICS.

*Table 1 Deviations from the geometrical form for die*

Index [grade]	Stamp OSC10 with improved OSC10 die [0.01mm]	Stamp OSC10 with nitride OSC10 die [0.01mm]	Stamp OSC10 with chromate OSC10 die [0.01mm]	Stamp OSC10 with covered sparks OSC10 die [0.01mm]	Stamp OSC10 with improved 205Cr115 die [0.01mm]
0	0	0	0	0	0
15	-1	1	0.25	0.5	2
30	-1	3.5	1.5	2	3
45	-12	4	2.5	3	5
60	3	5	3	3	7
75	5	6	4.5	4	8
90	4	10.5	7	7	7
105	9	9.5	7.5	7	6
120	-14	13	9	8	8
135	13	14	8	8	8
150	12	12	7	8	9
165	13	12	7.5	7.5	10
180	12	11	8	8	12
195	15	8.5	8	8	13
210	14	9	7.5	7	11.5
225	13.5	8.5	6	7	9
240	6	7	6	6	7.5
255	8	5	5.5	5	8
270	7	4	5	4.5	6
285	-11	3	4	3	4
300	4	2	3.5	2.5	3
315	3	1	2	2	2
330	3	1	1.5	2	2
345	1	0	1	1.5	1
360	0	0	0	0	0

In table 1 will be shown deviations from the geometrical form for die and in figures 1-5 will be shown circular deviations.

## 2. Statistics processing of experimental information

Through statistic processing of information was observed the determination of some mathematical models which will offer the analytical dependence of deviation from the geometrical form developed in the process of penetration of the tool in the half – finished material of the board.

Due to the fact that only mathematical models do not offer a concluding image on the variation of the cutting forces was necessary and tracing some evolution diagrams of deviations from the geometrical form depending on the penetration, characterizing these models.

My using mathematical models to establish force, will be realized a very high economy of time, materials and energy because is not necessary to realize experimental researches. Mathematical models were established so that to obtain the penetration force of the die in half – finished. The dependence of the variation of the penetration force, expressed analytical, offers us a precise image of the independent variable influence on response measure and eventually allows us to establish optimal technologies of realizing dies, for which the response measure has minimal value. Mathematical models which offer us analytical dependence of the independent variable force for each material as are given by equations presented in table 2, where y- signifies force given in daN and x- penetration in half-finished products, expressed in hundredth of millimeter.

**Table 2 Dependency of deviation from the geometrical form of independent variable**

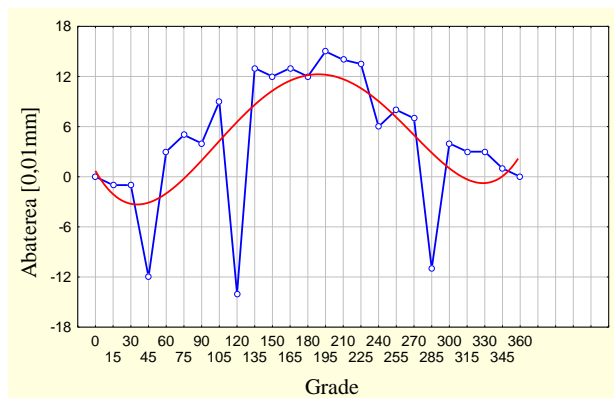
<b>Stamp OSC10 with improved OSC10 die</b>	$y = 0.70642 - 0.24927 * x + 0.00448 * x^2 - 1.92497e-5 * x^3 + 2.00222e-8 * x^4 + 1.1943e-11 * x^5 + \text{eps}$
<b>Stamp OSC10 with nitride OSC10 die</b>	$y = 0.42714 - 0.00626 * x + 0.00277 * x^2 - 2.30358e-5 * x^3 + 6.49748e-8 * x^4 - 6.18832e-11 * x^5 + \text{eps}$
<b>Stamp OSC10 with chromate OSC10 die</b>	$y = -0.17294 + 0.01897 * x + 0.0014 * x^2 - 1.22014e-5 * x^3 + 3.56024e-8 * x^4 - 3.58943e-11 * x^5 + \text{eps}$
<b>Stamp OSC10 with covered sparks OSC10 Die</b>	$y = 0.08797 + 0.01876 * x + 0.00124 * x^2 - 1.02283e-5 * x^3 + 2.75861e-8 * x^4 - 2.52654e-11 * x^5 + \text{eps}$
<b>Stamp OSC10 with improved 205Cr115 die</b>	$y = -0.10052 + 0.18193 * x - 0.00223 * x^2 + 1.72317e-5 * x^3 - 6.13155e-8 * x^4 + 7.46024e-11 * x^5 + \text{eps}$

For a vast analyze of variation of deviations from geometrical form was also realized a graphical processing of the results of the experimental research which allows the comparison of determinations on analytical manner in comparison with the ones obtained on experimental manner.

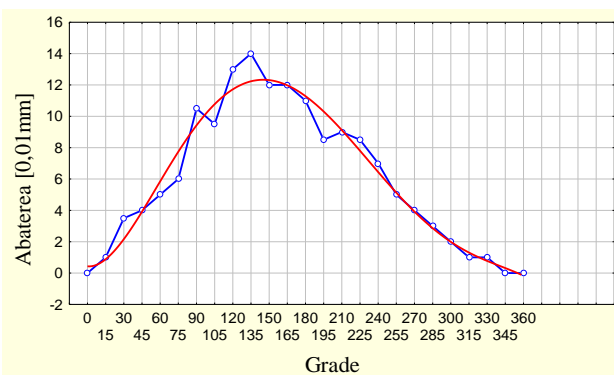
To be able to realize a more correct interpretation of deviation from geometrical form influenced by the independent variable was necessary a graphical presentation of

dependences of deviation from geometrical form of displacement on contour. These dependences for each separate material are presented in figures 1-5.

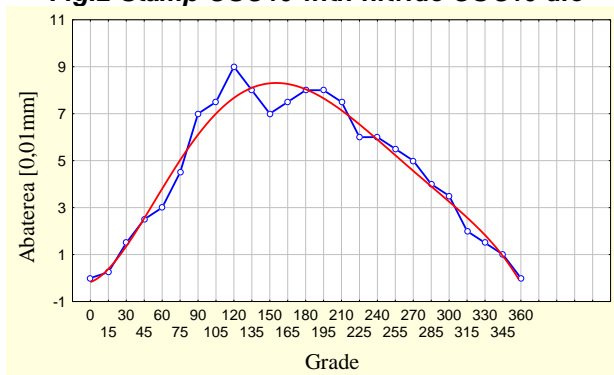
### 3 Graphics exponential mathematical models for the approximation of the evolution of deviation from geometrical form for stamp



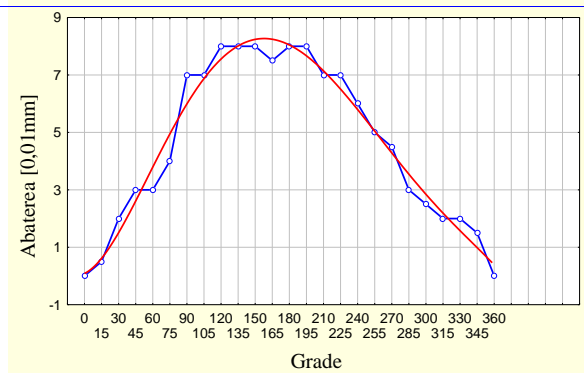
**Fig.1** Stamp OSC10 with improved OSC10 die



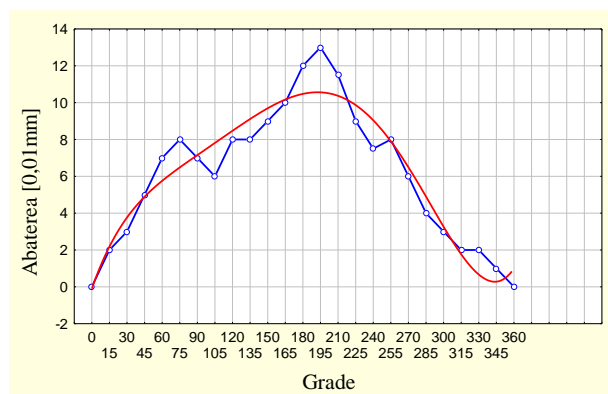
**Fig.2** Stamp OSC10 with nitride OSC10 die



**Fig.3** Stamp OSC10 with chromate OSC10 die



**Fig.4 Stamp OSC10 with covered sparks OSC10 die**



**Fig.5 Stamp OSC10 with improved 205Cr115 die**

#### 4. Conclusions:

Researches allow the following behavior conclusions which correspond to the ones obtained at previous chapters;

- from above mentioned diagrams it can be observed the fact that matrixes presents the traces of wear process.
- minimal and maximal as well as the sudden deviation of graphic are explained through the fact that on the edges of the actives elements there are pinches, traces of seizing, as well as portions that are plastically deformed.
- as a result of the evolution of diagrams, it results that that best at wear behaved die from steel OSC10 covered with sparks followed closely by die from steel OSC10 chrome plated and less good behaved die from steel OSC10 improved;
- the oval form of matrix used in cutting process is due to the fact that cutting is made along fibers as well as perpendicular on these, the resistance of the material being different, which makes usage more accentuated on certain portions.

It results that the best durability is of die OSC10 covered with sparks and the smallest is that of die OSC10 improved.

#### 5. Bibliography

- [1] Stăncioiu Alin, Cercetări cu privire la influența calității sculelor asupra proceselor tehnologice de tăiere, Universitatea din Craiova, Teza de Doctorat, 2004
- [2] Șonțea, Sever., Tratamente termice și termochimice, Editura Spirit Românesc, Craiova, 2001
- [3] Ciocîrdia, C., șa – Tehnologia presării la rece, Editura Didactică și Pedagogică, București, 1991