ANNALS of the ORADEA UNIVERSITY.

Fascicle of Management and Technological Engineering, Volume VII (XVII), 2008

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

Alin STĂNCIOIU*
Gheorghe GÎRNICEANU**
Gheorghe POPESCU***

** Lect. dr. eng. U.C.B, Tg-Jiu, e-mail* alin@utgjiu.ro
*** Prof. dr. eng. U.C.B,Tg-Jiu, e-mail* girniceanu@utgjiu.ro
**** Prof. dr. eng. U.C.B,Tg-Jiu, e-mail* gepo@utgjiu.ro

Keywords: deviations, geometrical form, statistic.

Abstract: By statistically processing the experimental research results, mathematic patterns have been obtained with the active tools deviations from the geometrical form through which tension and deformations states can be appreciated. Besides the mathematic expression there was also obtained a graphic representation of the deviations from the geometrical form s increase dependence in report with the independent variable. The mathematic modeling allowed also to obtain some results and displays a concluding image upon the phenomenon's evolution way.

1.Introduction

A study case was realized in this paper regarding the usage of tools used in stamping operation after 16.000 strokes with the aid of the method of deviation from circularity.

Due to the fact that the material of half-finished board are fibers oriented in the direction of lamination of cutting tools meets resistance in a different manner on their circumference. On some portions edges penetrates perpendicular on fibers, the cutting material opposing higher resistance and obtained a more pronounced wear of the edges. On some other portions, edges penetrate parallel with fibers; the resistance of the material in this case is smaller and can be realized a less pronounced wear.

2. Analyze of the geometrical form of dies

Pieces were caught between top and centered, and with the aid of the comparison apparatus were gathered information that were processed with the program of diagrams STATISTICS on computer Pentium IV.

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

3. Statistics processing of experimental information

Deviation from geometrical form is one of the phenomena that will be realized during life of an active tool for stamping. Experimental information does not offer us concluding information on deviation from the geometrical form and that is why was necessary their statistic processing. By statistic processing of the experimental information was attended the determination of the analytical and graphical dependences of the deviations from the geometrical form.

Table 1 Deviations from the geometrical form for die

Index [grade]	Improved OSC10 die [0.01mm]	Nitride OSC10 die [0.01mm]	Chromate OSC10 die [0.01mm]	Covered sparks OSC10 die [0.01mm]	Improved 205Cr115 die [0.01mm]
0	0	0	0	0	0
15	3	1	0.25	1	0
30	4	3	0.25	3	1
45	8	4	1	3	1
60	12	5	1.25	4	1
75	15	6	2	3	2
90	17	10	2	2.5	2
105	18	9.5	3	2.75	3
120	20	13	3.5	3	4
135	22	16	4	2	4
150	22	12	4.5	1	5
165	23	12	3.75	0.4	6
180	23	10.5	4	0	6
195	21	8.5	3.5	0	6.5
210	23	9	3	0	6
225	22	8.5	2	0	5.5
240	22	8	2.5	0	5
255	21	5	2	0	5
270	18	4	0.5	0	3.5
285	11	3.5	0	0	3
300	8	3	0	0	2
315	7	1	0	0	1
330	5	1	0	0	1
345	3	0.5	0	0	0
360	0	0	0	0	0

Analytical expressions of deviation from geometrical form allow the determination of tools deviations for different values of the independent variables (degrees). So, by using these mathematical models will be eliminated the study of deviations from the geometrical form regarding experimental researches. Mathematical models which offer us analytical dependency of deviation from the geometrical form of independent variable are present in table 2 .

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

Improved OSC10 die	y = -0.72743+0.24975*x-0.001*x^2+6.93121e-6*x^3-3.24749e-8*x^4+4.55106e-11*x^5+eps
Nitride OSC10 die	y = 0.46272-0.02629*x+0.00324*x^2-2.66866e-5*x^3+7.66224e-8*x^4-7.50116e-11*x^5+eps
Chromate OSC10 die	y = 0.20295-0.02678*x+0.00116*x^2-7.95178e-6*x^3+1.89153e-8*x^4-1.45163e-11*x^5+eps
Covered sparks OSC10 die	y = -0.24684+0.14433*x-0.00182*x^2+8.33338e-6*x^3-1.61755e-8*x^4+1.11114e-11*x^5+eps
Improved 205Cr115 die	y = 0.0894+0.00728*x+1.29349e-4*x^2+2.13339e-6*x^3-1.60933e-8*x^4+2.50503e-11*x^5+eps

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

4 Graphics exponential mathematical models for the approximation of the evolution of deviation from geometrical form for dies

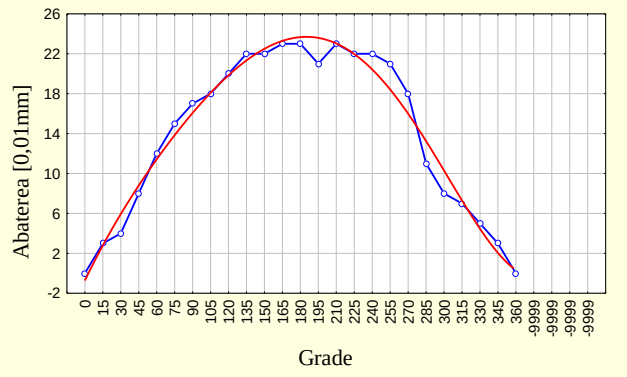

Fig.1 Improved OSC10 die

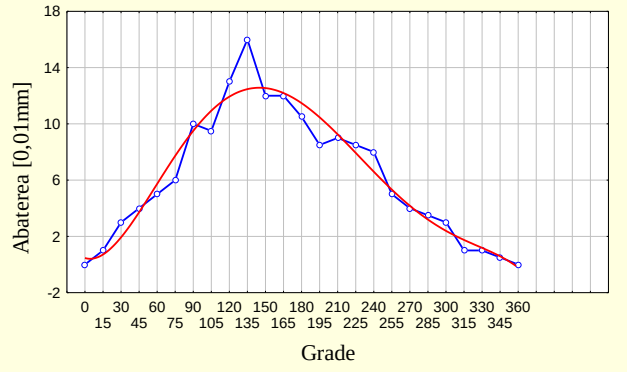

Fig.2 Nitride OSC10 die

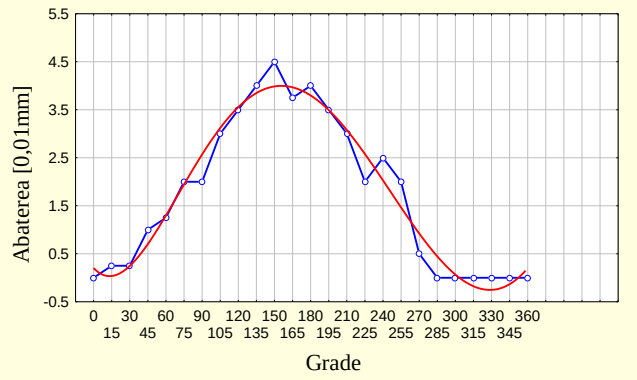

Fig.3 Chromate OSC10 die

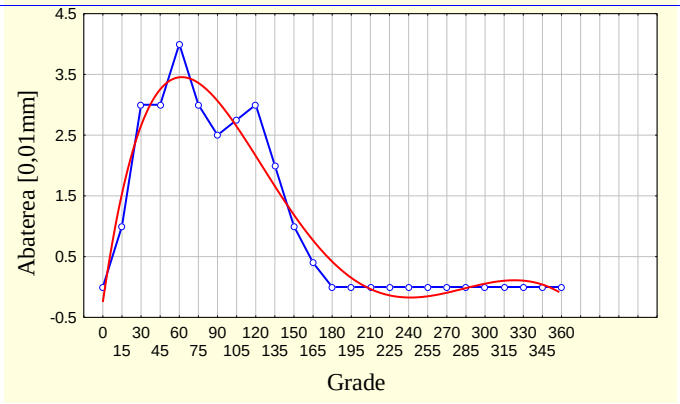

Fig.4 Covered sparks OSC10 die

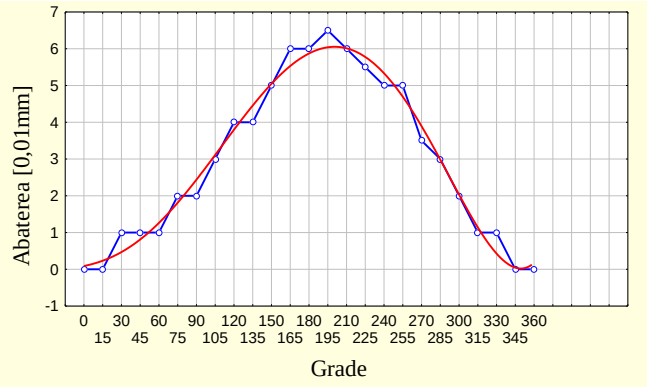

Fig.5 Improved 205Cr115 die

5. Conclusions:

Regression and residual analyses realized for presented mathematical models, offers the possibility of issuing some conclusions regarding the deviation from geometrical form as follows:

- errors introduced by using mathematical models, for the determination of deviations from geometrical form, instead of experimental researches will be framed in satisfying limits because experimental graphical curves deviates unexpected up and down due to pinches and dislocations of material from active tools;
- patterns which approximates best the experimental results are the polynomial ones.
- after the graphical evolutions analyzes regarding minimal and maximal as well as their sudden deviation results that, at damage, best behaved die from steel OSC10, covered with sparks followed closely by die from steel OSC10 chrome plated and les good behaved die from steel OSC10 improved;

6.Bibliography

[1] Stăncioiu Alin, Cercetări cu privire la influenţa calităţii sculelor asupra proceselor tehnologice de tăiere, Universitatea din Craiova, Teza de Doctorat, 2004

[2] Şontea, Sever., Tratamente termice şi termochimice , Editura Spirit Românesc, Craiova, 2001

[3] Ciocîrdia, C., şa – Tehnologia presării la rece, Editura Didactică şi Pedagogică, Bucureşti, 1991