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RESEARCH OF THE ROUGHNESS PROFILE HEIGHT PARAMETRS OF THE SURFACE MACHINED BY TURNING

Avdi Salihu
Faculty of Applied Technical Sciences
Fabrika e akumulatorve, Mitrovicë
Kosovë

Avdyl Bunjaku
Faculty Mechanical Engineering
Kodra e Diellit Prishtinë
Kosovë

Hakif Zeqiri
Faculty of Applied Technical Sciences
Fabrika e akumulatorve Mitrovice
Kosovë

Nexhat Qehaja &Azem Kycyku
Faculty Mechanical Engineering
Kodra e Diellit Prishtinë
Kosovë

ABSTRACT
In this work are shown researched experimental results of the roughness profile height parameters of the machined surface. The machining was performed on a numerically controlled lathe Gildemeister MD 5S where as researched material is used steel C45. For the measuring of the roughness profile height parameters a computerized measuring equipment Talysurf 6 of the company Taylor Hobson was used. The research was performed with the application of the theory of poly factorial experiment planning.
Keywords: chip, lathe, surface machined, height parameters

1. INTRODUCTION
The process of processing with cutting is done with the purpose of obtaining determined parts with determined quality and characteristics. The quality of the mechanical part shows complex index that is the function of mechanical part construction, the quality of processing system , projecting of processing process, quality of material and factors etc[4].
In the process of cutting s impossible to obtain the ideal flat surface accurately processed. The processed surface has in a small or large amount deviation or errors from the given form in the drawing. The deviations of geometrical form show non-accordance of the real surface or real profile with the given geometrical form or geometrical profile [2].
The roughness parameters are classified in three basic groups. The first group consists of permanent parameters of roughness profile that include: the height parameters, horizontal parameters, planimetric and spotted parameters. The second group consists of functional parameters , whereas the third group consists of function of roughness profile.
In this work are presented obtained mathematical models for the height parameters of roughness surface in function of processing parameters by turning.

2. CONDITIONS FOR EXPERIMENT REALIZATION
Machine: The experiments for measurement of roughness parameters of the surface process are realized by numeric lathe model MD 5S GILDEMEISTER P = 1.85 – 25 kW with rotating nr. fields n=100–4000 rot/min and feed 0.001–39.99 mm/rot.
Metal cutting instrument: The cutting inserts: SNGN 120708 -120712-120720 from mixed ceramic (Al_2O_3 + TiC) of HERTELL company are used. Also, the tool holder is used CSRNR 25x25

M12H3 that the cutting edge obtains these values: $\chi = 75^\circ$, $\chi_1 = 15^o$, $\gamma = -6^o$, $\alpha = 6^o, \lambda = -6^o, r_\varepsilon = 0.8 - 1.2 - 2.0.mm$ $\gamma_f = -20^\circ$, $b_f = 0.2.mm$.

Measure device: Measurement of parameters of the roughness on the processed surface is done with the computer measurement equipment Talasurf 6 of Taylor Hobson Company.

Research material: The rings are made of machined steel C45 (pursuant to DIN) in normal state with strength in limits of 185-200 HB with dimensions Ø 170 x 80 x 25 mm.

Processing parameters: The research process is realised with the change of *v, s, a* and *r* presented in Tab. 1 using the plan with many factors of the first row ($2^4 + 4$)[1].

Table 1 Characteristics of the factors

CHARACTERISTICS OF INDIPENDENT DIFFERENT SIZES					
Nr	Note	Level Code	Maximal1	Average 0	Minimal-1
1	v (m/min)	X1	700,000	458,258	300,000
2	s (mm/rot)	X2	0.400	0,283	0,200
3	a (mm)	X3	1,600	0,894	0,500
4	r (mm)	X4	2,000	1,265	0,800

3. ANALYSES OF THE RESEARCH RESULTS

Selected plan and the derived research results are shown in table 2 [1]. The processing of data is done by using automatic computer system [1]. In table 3 are shown obtained mathematical models for the height parameters of roughness surface whereas their graphic interpretation is shown in fig. 1 and 3.

Table 2. Derived results during experiment realization

EXSPERIMENTAL PLANN OF THE FIRST ROW WITH FOUR FACTORS										
.	REAL PLANN OF MATRIX – OF THE INDEPEDENT CHANGES				REZULTS					
Nr Ord.	*v* (m/min)	*s* (mm/rrot)	*a* (mm)	*r* (mm)	*Ra* (μm)	*Rq* (μm)	*Rt* (μm)	*Rv* (μm)	*Rz* (μm)	*Rp* (μm)
1	300.000	0.200	0.500	0.800	2.520	3.020	12.630	4.530	11.800	8.100
2	700.000	0.200	0.500	0.800	1.420	1.740	8.100	3.060	7.330	5.030
3	300.000	0.400	0.500	0.800	7.410	8.610	30.870	10.700..	29.770	20.170
4	700.00	0.400	0.500	0.800	5.580	6.420	23.270	7.870..	22.030	15.400
5	300.00	0.200	1.600	0.800	2.110	2.530	10.770	4.130..	10.000	6.630
6	700.000	0.200	1.600	0.800	1.330	1.660	8.100	3.100..	7.400	4.970
7	300.000	0.400	1.600	0.800	5.790	6.810	25.370	8.670.	24.430	16.700
8	700.000	0.400	1.600	0.800	7.140	8.120	28.500	12.170.	27.100	6.330
9	300.000	0.200	0.500	2.000	0.85	1.030	4.970	2.170	4.530	2.770
10	700.000	0.200	0.500	2.000	0.860	1.070	6.000	3.170	5.030	2.800
11	300.000	0.400	0.500	2.000	2.690	3.180	13.100	5.200	11.770	7.900
12	700.000	0.400	0.500	2.000	2.090	2.500	10.770	4.360..	9.660	6.430
13	300.000	0.200	1.600	2.000	0.910	1.090	5.100	2.430.	. 4.530	2.700
14	700.000	0.200	1.600	2.000	0.790	0.950	4.370	2.060..	3.930	2.300
15	300.000	0.400	1.600	2.000	2.240	2.810	12.770	5.200	11.530	7.570
16	700.000	0.400	1.600	2.000	2.380	2.790	11.270	4.830	10.030	6.400
17	458.258	0.283	0.894	1.265	2.170	2.680	12.500	4.600	11.200	7.900
18	458,258	0.283	0.894	1.265	2.250	2.630	11.800	4.700	10.700	7.200
19	458.258	0.283	0.894	1.265	2.080	2.570	11.800	3.900.	10.4007	7 800
20	458.258	0.283	0.894	1.265	2.430	2.900	12.800	5.100	11.500	7.700

The increase of height parameters of roughness surface with the increase of cutting feed *s* is as a result of conditions with which is realized the transformation process of cutting layer in a chip. Therefore with the increase of cutting feed *s* is increased the thickness of cutting layer. The contact

and friction surface between the chip and front surface, the cutting resistances of average temperature and conditions of heat all of these influence in technological effects of processed surfaces[4].
With the increase of depth of cutting *a* there is a small increase of height parameters because of conditions in which the process of plastic deformation is realized in the formation zone of the chip in the zone of the surface layer creation as well because of the presence of elastic deformations of the system (M-E-P-T) that is as a result of cutting resistance. The increase of nose radius *r* apparently influences in reduction of the non-flat heights of the processed surface. The influence of nose radius *r* is in combination with the cutting feed *s* and then is as a result of geometrical-cinematic review of the nose radius *r* of cutting plate in the processed surface[2].

Table 3. Review of derived mathematical models

Review of mathematical models		
Type of mathematical model	Form of mathematical model	
Without reciprocal act and without factors valuation that are important	$Ra = 80.658\ v^{-0.211}\ s^{1.656}\ a^{-0.0336}\ r^{-0.954}$	3.1
	$Rq = 91.544\ v^{-0.212}\ s^{1.611}\ a^{-0..0322}\ r^{-0.935}$	3.2
	$Rt = 218.899\ v^{-0.174}\ s^{1.350}\ a^{-0.0455}\ r^{-0.796}$	3.3
	$Rv = 44.644\ v^{-0.1008}\ s^{1.212}\ a^{-0.00745}\ r^{-0.598}$	3.4
	$Rp = 221.285\ v^{-0.233}\ s^{1.457}\ a^{-0.0657}\ r^{-0.936}$	3.5
	$Rz = 246.733\ v^{-0.199}\ s^{1.388}\ a^{-0.0404}\ r^{-0.853}$	3.6

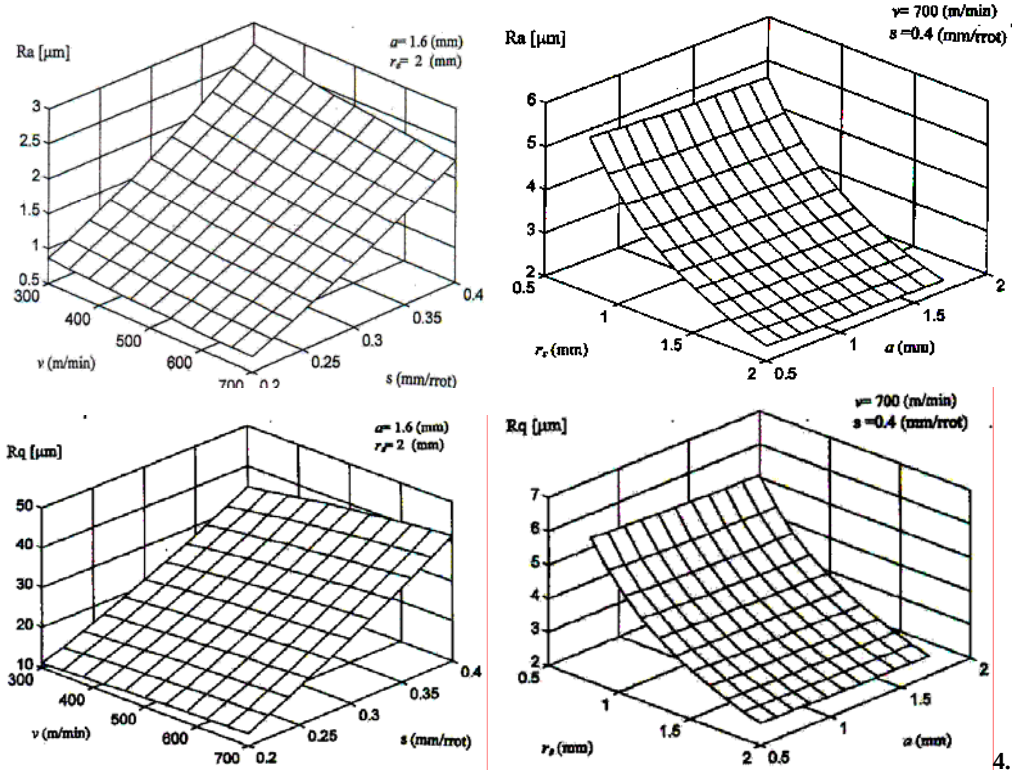

Figure 1. Graphic interpretation of mathematical models 3.1-3.2.

4. CONCLUSION

Derived mathematical models analyses as a result of experimental research made us possible to give the following conclusions:

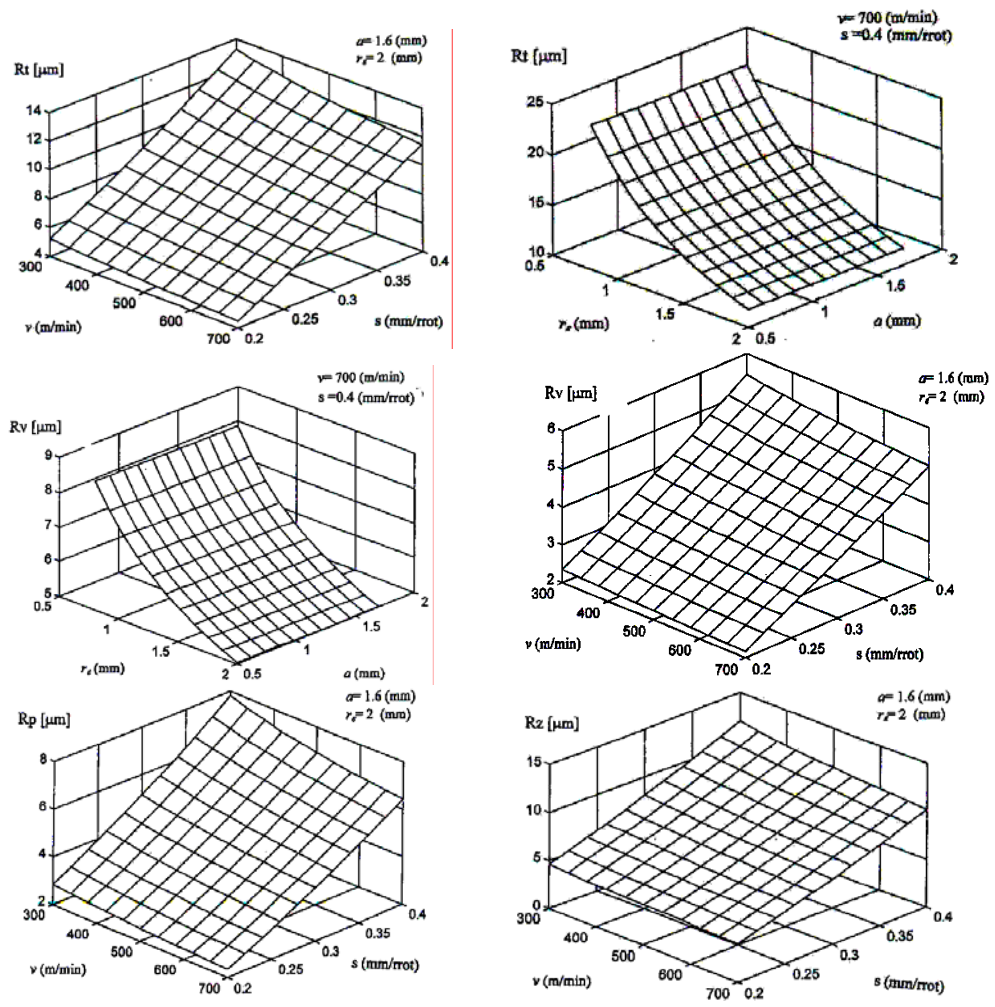

Figure 2. Graphic interpretation of mathematical models 3.3-3.6.

- with the increase of cutting speed there are changed the conditions in cutting zone where comes up to the creation of chip wherein are reduced plastic deformations in formation zone of the chip and in the creation zone of the surface layer that influences in reduction of prominence surfaces.
-the influence of cutting feed in the changes of parameters of height is mutual.
- with the increase of cutting depth are increased prominence surfaces in the processed surface.
-with the increase of nose radius is reduced the height of prominence surfaces of the processed surface.

5. REFERENCES

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