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Effect of Machining Parameters on Surface Roughness with Turning Process- Literature Review

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ABSTRACT

The aim is to study the machining parameters and effect of them on surface roughness. A good number of published papers have been studied and a literature review has been presented to identify and mention the gap for further research.

Keywords: *Speed; Feed; Depth of Cut; Nose Radius; Surface Roughness; Turning.*

1.0 Introduction

Surface condition is being determined by several factors:

- Cutting parameters (cutting speed, feed)
- Tool geometry (angle and sharpness of the cutting edge, corner radius, etc)
- The material the cutting tool is made from the rigidity of the assembly and of the machine,
- The forming of chips, cutting forces, etc.

The process of production of large number of items requires removing the excess material from the raw material. The activity involves large number of machine as well as human parameters which makes it complex phenomenon.

The production activity determines the overall cost of the basic product. In the age of competition the cost has to be minimal.

To achieve this, production activity needs to be optimized in terms of cost/time. The cost/time of production depends upon human parameters such as competency level and wages whereas the machine parameters are speed, feed, depth of cut and the number of passes.

These parameters apart from the production rate, influence quality of finished product during a machining operation.

To study the influence of various parameters involved one needs to find out from the available data, the practice involved and the shortcomings if any and the possible remedial measures.

2.0 Literature Review

In this paper the Literature Review has been presented in a tabular form. A number of published papers related to the machining area have been studied.

Nearly 60 papers related to study of machining parameters have been separated for further consideration of detailed study.

Machining parameters such as speed, feed, depth of cut, nose radius and rake angle have been studied in detail along with their effect on surface roughness.

Many researchers have considered only Speed, feed and Depth of cut as input parameters.

The review table given below explains the details of parameters considered in earlier studies by various researchers. Y represents the consideration of the parameter and X represents parameter not in consideration.

Wherever the parametric values are available, they have been mentioned respectively in the table given below.

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Table 1: Published Work on the Study of Effect Machining Parameters on Surface Roughness

Serial No	Author	Spindle Speed (rpm) / Cutting Speed (m/min)	Feed (mm/rev)	Depth of Cut (mm)	Nose Radius (mm)	Rake Angle (Degrees)
1	[1978]Sundaram	Y	Y	Y	X	X
2	[1981]Sundaram and Lambert	Y	Y	Y	X	X
3	[1996]D. Gillibrand et al.	150, 200, 250	0.99, 0.122, 0.144	0.8	X	X
4	[1998]I. A. Choudhury and M.A. El-Baradie	28, 36, 65, 117, 150	0.12, 0.15, 0.25, 0.40, 0.50	0.42, 0.50, 0.75, 1.125, 1.33	X	X
5	[1998]S. V. Bhaskara Reddy et al.	Y	X	Y	X	X
6	[1998]W.H. Yang and Y.S. Tarng	135, 210, 285	0.08, 0.20, 0.32	0.6, 1.1, 1.6	X	X
7	[1999]C. Y. Niana et al.	135, 210, 285	0.08, 0.20, 0.32	0.6, 1.1, 1.6	X	X
8	[1999]C. Y.H. Lim et al.	Upto 140	0.1, 0.2, 0.3, 0.4, 0.5	X	X	X
9	[1999]Santos et al	Y	Y	Y	X	X
10	[2000]B. Y. Lee et al.	135, 210, 285	0.08, 020, 0.32	0.6, 1.1, 1.6	X	X
11	[2000]J. Wang	108, 206	0.13, 0.17, 0.21	0.5, 1.0, 2.0	X	8, 1
12	[2000]Q. Meng et al.	100 to 300	0.1 to 0.4	1.5 to 4.5	X	X
13	[2001]C. H. Che Haron et al.	Y	X	X	X	X
14	[2002]N. R. Dhar et al.	66, 85, 110, 144	0.12, 0.16, 0.20, 0.24	X	X	X
15	[2003]P. G. Benardos and G.C. Vosniakos	Y	Y	Y	X	X
16	[2004]Anselmo Eduardo Diniz and Adilson Jose´ de Oliveira	290, 350	0.33, 0.40	1	X	X
17	[2004]R. T. Coelho et al.	X	0.1	0.35	X	X
18	[2005]M. Cemal Cakir and Yahya Isik	80 to 240	0.12, 0.14, 0.16, 0.2, 0.24	0.5, 1.0, 1.5, 2.0	X	X
19	[2005]Ruey-Jing Liana et al.	Y	Y	X	X	X
20	[2007]Hari Singh and Pradeep Kumar	210, 240, 270, 280, 190, 310	0.13, 0.18, 066, 0.12, 020	0.75, 0.93, 0.84, 0.7, 1.00		X
21	[2007]J. Paulo Davima et al.	71, 141, 283	0.16, 0.25	0.5, 0.75, 1.0	X	X
22	[2008]K. Palanikumara et al.	100, 200, 400	0.05, 0.1, 0.2	X	X	X
23	[2008]Y. Sahin and A.R. Motorcu	103, 138, 173, 208, 243	0.10, 0.134, 0.169, 0.203, 0.238	0.41, 0.54, 0.67, 0.80, 0.93	X	X
24	[2008]Y. Sahin and A.R. Motorcu	103, 138, 173, 208, 243	0.10, 0.134, 0.169, 0.203, 0.238	0.41, 0.54, 0.67, 0.80, 0.93	X	X
25	[2008]K. Palanikumara et al.	100, 200, 400	0.05, 0.1, 0.2	X	X	X
26	[2009]Ali Riza MOTORCU	306, 408, 510, 612, 714	0.145, 0.20, 0.255, 0.310, 0.365	0.4, 0.57, 0.71, 0.85, 0.99	X	X
27	[2009]Dejan Tanikic	80, 140	0.098, 0.071,	0.5, 2	X	X

	et al.		0.321			
28	[2009]Karin Kandanand	5000, 8000	0.0002, 0.008	0.1, 0.2	X	X
29	[2010]D. Philip Selvaraj and P. Chandramohan	80, 100, 120	0.08, 0.10, 0.12	0.4, 0.6, 0.8	X	X
30	[2010]H. Yanda et al.	220, 300, 360	0.2, 0.3, 0.5	2	X	X
31	[2011]Adeel H. Suhail et al.	950, 1150, 1400	0.5, 0.75, 1	0.5, 0.75, 1	X	X
32	[2011]Hardeep Singh et al.	1000, 1260, 1600, 2000	0.05, 0.1, 0.2, 0.3	0.5, 1, 1.5, 2	X	X
33	[2011]M.Ramalinga Reddy et al.	X	0.106, 0.160, 0.283, 0.319	0.8	X	X
34	[2011]Suleiman Abdulkareem et al.	1000, 1500, 2000	0.5, 0.8, 1.0	X	X	X
35	[2011]Praveen Pandey and V.K. Gupta	158, 480	0.15	0.5, 1	X	X
36	[2012]R. Karuppasamy et	1000, 1750, 2500	0.1, 0.2, 0.3	0.5, 1.0, 1.5	0.4, 0.8,	X

	al.				1.2	
37	[2012]M. Kaladhar et al.	150, 170, 190, 210	0.25, 0.20, 0.25, 0.30	0.5, 1.0, 1.5, 2.0	0.4, 0.8	X
38	[2012]M. Venkata Ramana et al.	63, 79, 99	0.206, 0.274, 0.343	0.6, 1.0	X	X
39	[2012]Manish Kumar Yadav et al.	180, 280	0.071, 0.14	0.8, 1.4	X	X
40	[2012]Rahul Davis	780, 1560, 2340	1.21, 1.81, 3.63	0.5, 1.0, 1.5	X	X
41	[2012]Rodrigues L.L.R et al.	228, 360, 450	0.11, 0.18, 0.75	0.25, 0.50, 0.75	X	X
42	[2012]S. S. K. Deepak	105, 115, 125, 135, 145, 155, 165, 175, 185, 195	0.02, 0.04, 0.06, 0.08, 0.10, 0.12, 0.14, 0.16, 0.18, 0.20	X	X	X

43	[2012]S. S. K. Deepak	Y	Y	Y	X	X
44	[2012]Yansong Guoa et al.	140, 340	0.05, 0.1	1	X	X
45	[2013]Adnan Jameel and Mohamad Minhat et al.	Y	Y	Y	X	X
46	[2013]Jakhale Prashant P and Jadhav B. R.	100, 125, 150	0.24, 0.26, 0.28	1, 2, 3	X	X
47	[2013]Raman Kumar et al.	1500, 1600, 1700	0.08, 0.1, 0.12	0.6, 0.8, 1	0.4, 0.8, 1.2	X
48	[2013]Sudhansu Ranjan Das et al.	60, 90, 120, 150	0.05, 0.1, 0.15, 0.2	0.2, 0.3, 0.4, 0.5	X	X

3.0 Conclusions

- From the published work, it is clear that most of the earlier research work used speed, feed and depth of cut as input parameters for studying the surface roughness.
- Some of them have considered nose radius as one of the parameter.
- The published work is silent on simultaneous effect of tool geometry and material properties on surface roughness.

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