OPTIMIZATION OF PROCESS PARAMETERS FOR MACHINING DIFFERENT MATERIALS ON CNC MACHINE-REVIEW

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ABSTRACT

Now a day the most important process is turning for manufacturing industry. It helps to increase production rate with high quality. In CNC turning operation the surface roughness (SR), material removal rate (MRR), power consumption, nose radius and etc. are the output parameters. To evaluate process parameters surface roughness and material removal ate is too much important. There are some process parameters for turning purpose which are more important and considered as input parameters to measure SR and MRR. The input parameters are cutting speed, feed and depth of cut. In this paper we will study different review papers with different input and output parameters so as to conclude which input parameter is most beneficial for their particular output parameter.

INTRODUCTION

Manufacturing industry is very big and is having great resources to expand the definition of it. It is having great scope for increase productivity. By using the different processes of manufacturing one must increase the production rate in less time. So that the production will increase and production cost will reduce. The mass production with good quality of product is the key factor for any manufacturing industry. It involves different manufacturing processes in which turning is one of them. The turning plays vital role for mass production. In the manufacturing industry the main process for metal cutting is turning. The turning process defines as, "The process of removing unwanted material from rotating job which is fixed on chuck by using different cutting tool. (Generally single point cutting tool)"
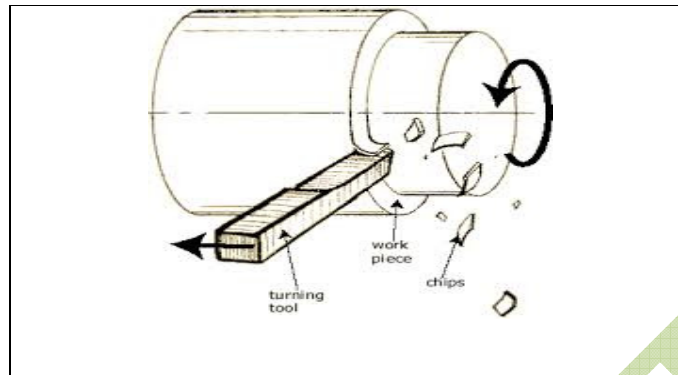
Figure No.1 - Turning Operation.

In the above figure it can be observed that the job is fixed with chuck and is rotating. The excess amount of material has been removed by using cutting tool. The tool advances with respect to work for each revolution is called as feed. The distance that the tool moved in work is called as Depth of cut. And the rotation per unit time of spindle is considered as spindle speed.

There are different methods used for the optimization of turning on different work metals. For optimization of turning process some input and output parameters should considered. In which some are theoretical and some are analytical. From all methods we pick one of the most preferred methods is TAGUCHI method.

TAGUCHI METHOD

The method of robust design is developed by Japanese researcher Dr. Genichi Taguchi. The method of reducing noise is very popular in the year of 1980. It is used by the1960 but its importance and effectiveness over existing method is realized by other companies in 1980. Previously the quality is checked by inspection of individual product only. That is the reason so that rejection rate of product is high. Taguchi says that the quality should check from start.

LITERATURE REVIEW

M. Adinarayana, et al. [1] tested the material AISI 4340 Alloy steel for optimization of power consumption where input parameters are speed, feed, DOC. The result is most significant factor is speed followed by feed.

R. Suresh, et al. [2] studied the AISI 4340 Alloy Steel for optimization of power consumption. Inputs are cutting speed, DOC, feed and major influence is cutting speed (77.67%) followed by feed rate (17.39%) and depth of cut (2.82%).

Mr. Manoj Kumar Sahoo [3] investigated the different materials by considering spindle speed, feed, DOC. Experiment was done by keeping one process parameter fixed and other is moving. The result is surface roughness is high when DOC is first and feed is second preferred parameter.

Dr. S. S. Chaudhari et.al [4] experimented the HSS material and base parameters are speed, feed, DOC and nose radius. The experimental study output is the surface roughness and MRR is at best optimum level when speed and DOC is at maximum level and feed is at minimum level.

Ajay Mishra and Dr. Anshul Gangele [5] both are studied to check the tool flank wear when tool material is tungsten carbide tool when material is AISI 1045 Alloy Steel. The characteristics of

material is tested as other speed, feed, DOC. The Taguchi method suggests that the speed is most influenced parameter and other are under study.

H. K. Dave et. al [6] investigated the different grades of EN material and different machining characteristics like speed, feed, DOC, tool insert, nose radius. The ANOVA and Taguchi technique is used to optimize the process. The output parameter is MRR and SR and most efficient parameter is DOC according to ANOVA and tool insert followed by feed.

Jakhale Prashant et. al. [7] presented investigation of optimization of cutting parameters (speed, feed, DOC) for surface roughness on the alloy steel. The ANOVA and L9 orthogonal array was implemented for it and result is DOC is best, speed is better, and feed is good.

Anil Gupta *et al.* [8] come to conclude that speed is most preferred parameter and nose radius is second preferred parameter. The speed, feed, DOC, nose radius and cutting environment is been studied to check surface roughness, tool life, cutting force and power consumption on the AISI P-20 tool steel.

Chakradhar, D. and Venu Gopal, A. [9] has done investigation for material EN- 31 steel with electrolysis process. The electrolyte concentration, feed, applied voltage is input while MRR, SR, over cut, cylindricity is output. Feed rate plays important role followed by applied voltage.

Hassan, K. et al. [10] investigated cutting parameters speed, feed, DOC, nose radius, cutting environment. L27 array is used to investigate the MRR. It was concluded that MRR is mainly affected by cutting speed and feed rate.

Table No. 1 shows Tools and Techniques used by various authors.

SR. NO.	AUTHOR NAME	MATERIAL	INPUT PARAMETERS	OUTPUT PARAMETERS	MOST EFFICIENT PARAMETER	
1	M. Adinarayana	AISI 4340 Alloy Steel	Speed, Feed, and DOC	Power Consumption	Speed	Feed
2	R. Suresh	AISI 4340 steel	Speed, Feed, and DOC	Power Consumption	Speed	Feed
3	Manoj Kumar Sahoo	Any	Speed, Feed, DOC	Surface roughness	DOC	Feed
4	S. S. Chaudhari	HSS	Speed, Feed, DOC, nose radius	MRR, Surface roughness	Speed, DOC	Feed
5	Ajay Mishra and Dr. Anshul Gangele	AISI 1045 Steel	Speed, Feed, DOC	tool flank wear width	Speed	Under Study
6	H. K. Dave	Different Grades of EN materials	Speed, Feed, DOC, Tool insert, Nose radius	MRR, Surface Roughness	DOC, Tool Insert	Feed
7	Jakhale Prashant	Alloy Steel (280 BHN).	Speed, Feed, DOC	Surface roughness	DOC	Speed
8	Gupta Anil	AISI P-20 tool steel	Speed, Feed rate, DOC, nose radius and cutting environment	surface roughness, tool life, cutting force and power consumption	Speed	nose radius
9	Chakradhar, D. and Venu Gopal	EN-31 steel	electrolyte concentration, feed rate and applied voltage	material removal rate, over cut, cylindricity error and surface roughness	Feed Rate	Applied Voltage
10	Hassan K.	C34000	Speed, Feed rate, DOC, nose radius and cutting environment	MRR	Speed	Feed Rate

CONCLUSION

From the above literature review we found that there is most common input parameters are used by researchers is feed (10/10), cutting speed (9/10), and depth of cut (9/10).The remaining inputs are not used frequently by the researchers which are as follows-1.nose radius (3/10) 2.cutting environment (2/10) 3.insert (1/10) 4.electrolyte concentration (1/10) 5.applied voltage (1/10).

Also it can be observed that MRR and surface roughness are the mostly used as a output parameters in the research papers. And the most significant factor for MRR is speed followed by feed, DOC whereas for surface roughness its DOC followed by speed, feed.

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