WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Optimization of Cutting Parameter for CNC Turningby Taguchi Method

Nitesh Rawal[1], Kamlesh Gangrade[2]

[1]PG scholar, Department of Mechanical Engineering, Sagar Institute of research and Technology, Indore

[2] Associate Professor, Department of Mechanical Engineering, Sagar Institute of research and Technology, Indore

ABSTRACT

The significance of machining parameters in the study was determined by a series of machining tests on specimens, and the Taguchi technique (orthogonal array) was modified for the trials. A confirmation test was carried out using the best possible combination of cutting parameters. The surface damages and other surface flaws caused by the machining operations were evaluated on the machined samples. The link between turning parameters and surface roughness is investigated in this study in order to identify the impact of various parameters on the machined surface quality. By doing so, real production time is saved, processing efficiency is implemented, and resource consumption in the actual production process is lowered, resulting in increased process capability.

Keywords- Taguchi, Surface roughness, Turning, Cutting factor, Optimization,

INTRODUCTION

As quality and productivity play a vital part in today's industrial industry, manufacturing companies are constantly demanding faster production rates and improved machine capability. The degree of satisfaction of consumers with the procured item (or product) is influenced by the quality of the procured item (or product). Taguchi's parameter design, which we provide in this project, is a systematic approach for optimising numerous parameters in terms of performance, quality, and cost in order to achieve optimal machining parameters for CNC turning.Surface roughness is an important indicator of a product's technological excellence and a component that has a significant impact on manufacturing costs. The quality of the surface has a substantial impact on the turning performance, since a high-quality turned surface improves fatigue strength, corrosion resistance, and creep life. Surface roughness also has an impact on surface friction, light reflection, lubricant retention, and electrical and thermal contact resistance. As a result, the intended surface roughness value for a particular part is usually specified, and specific techniques are used to attain the given finish.

PROBLEM STATEMENT

When determining the proper machining parameters to achieve a specified level of dimensional accuracy and surface finish, a manufacturing engineer or CNC machine setup technician is frequently expected to draw on the experience of the floor personnel as well as published shop guidelines and handbooks. This must be completed in a timely manner to minimise production delays, effectively to avoid faults, and the quality of the parts produced must be monitored. As a result, in this case, the engineer or technician should use previous experience to select parameters that would likely result in a surface roughness lower than the prescribed level, and maybe make some parameter tweaks as time permits or quality control demands.

OBJECTIVE OF WORK

The aims in this study are attention on

- To optimize the process cutting parameters viz. Cutting Speed, feed rate Spindle speed as well as depth of cut.
- To see the influencing contribution of each process parameter over the surface quality.
- To reduce the variations in dimensional geometry and achieve improvement in surface roughness along with better dimension conformance in CNC turning operation.
- To establish the redundant manufacturing system so that to improve the process capability after finalizing the optimized process parameters.

RESULT

The main aim of our project is to optimize the Surface roughness of the turning process. In this work L9 array was used to carry out the experiments.The response, cutting speed, Feed and depth of cut weremeasured by varying the machining parameters and thecorresponding values are shown in tables.

Table 4.1 Analysis Results for all Specimens

Aluminium Material Specimen			
Surface Roughness value µm	Spindle Speed rpm	Feed rate mm/ rev	DOC mm
1.05	160	0.012	0.5

Copper Material Specimen			
SurfaceRoughness value µm	Spindle Speed rpm	Feed rate mm/ rev	DOC mm
1.0264	660	0.012	1.0

Figure 4.1 Influence of spindle speed to surface roughness over Aluminium specimen

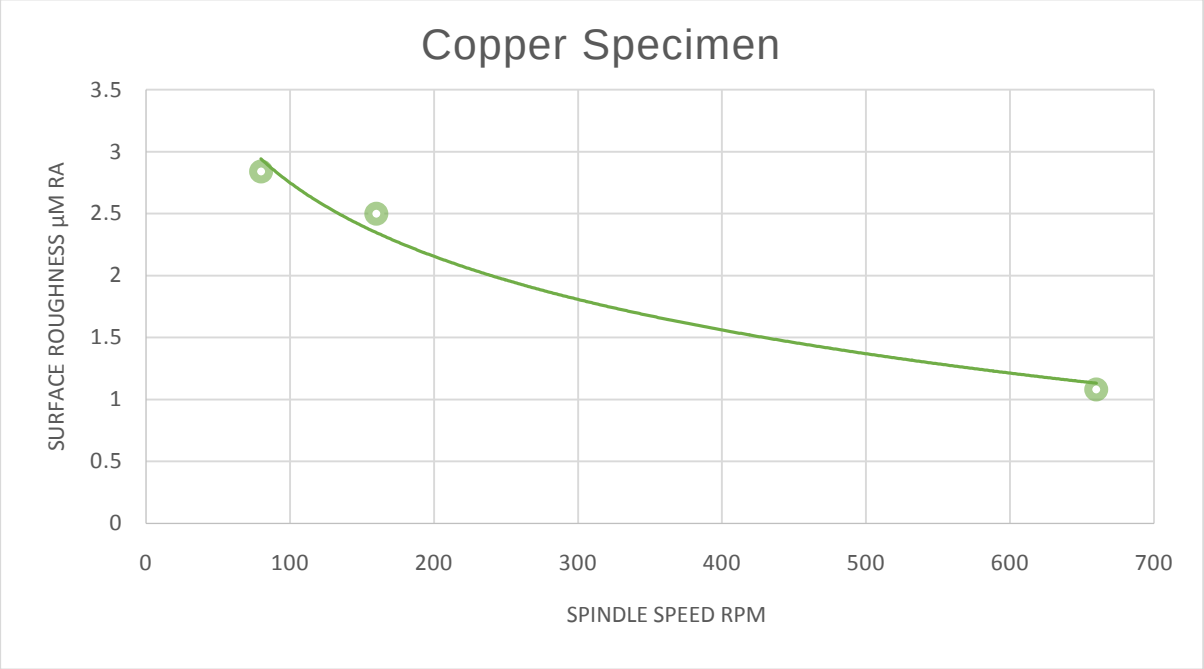

Figure 4.2 Influence of spindle speed to surface roughness over Copper specimen

CONCLUSION

This study concludes optimized process parameters such that cutting speed, feed and depth of cut in CNC turning operation of non-ferrous materials (Al & Copper) for getting better surface finish and geometrical dimensional conformance. In this experimental study spindle speed, feed rate and depth of cut taken as Control (input) Parameters and the surface roughness was treated as Response Parameter.

1) Input parameter setting of spindle speed 160 rpm, feed rate 0.012 mm/rev, and depth of cut 0.5 mm has been given the optimum result for **aluminium.**

2) Input parameter setting of spindle speed 660 rpm, feed rate 0.012 mm/rev, and depth of cut 1.0 mm has been given the optimum result for the **Copper** material was turned on CNC lathe.

The better combination of levels and factors (cutting parameters) – for Aluminum A2 B1 C3 and for Copper Specimen A1 B2 C3.

REFERENCES

[1] RoopaTulasi, RajveerSingh,andMohammadIrshadAli 2018"Optimizing Surface Roughness in Turning Operation Using Taguchi Technique "Volume 4, Issue 8,,matpr, Pages 8624-8632.

[2] SanchitKumarKhare,SanjayAgarwal, and ShivamSrivastavaa 2018 "Analysis of Surface Roughness during Turning Operation by Taguchi Method "Volume 5, Issue 9, Part 3,Pages 19043-19048.

[3]N.Rajesh.M.Yohan, P.Venkataramaiah,and M.Vanipallavi 2017"Optimization of Cutting Parameters for Minimization of Cutting Temperature and Surface Roughness in Turning of Al6061 Alloy"

[4] João Eduardo Ribeiro, Manuel BrazCésara andHernâni Lopes2017"Optimization of machining parameters to improve the surface quality"2nd International Conference on Structural Integrity, ICSI , 4-7 September 2017, Funchal, Madeira, Portugal.

[5] George A Pentazopoulos,AnagnontisTouplazis, Constantine N Devid, SagrisandAlkiviadis S. Paipetis 2018 "The machinability in turning mode of three lead-free brass alloys, CuZn42 (CW510L),CuZn38As (CW511L) and CuZn36 (C27450) was evaluated in comparison with a reference free-cutting."ELKEME Hellenic Research Centre for Metals S.A., 56th km Athens—Lamia National Road, 32011 Oinofyta,Greece.

[6] AD. Dev Singh, and BN. Yadav Raju2018"Optimization Of Surface Roughness of CNC Step Turning Components Using Taguchi Method"International Journal for Research in Engineering Application & Management (IJREAM) ISSN : 2454-9150 Vol-04, Issue-03

[7] M.A. Chowdhury, U.K. Debnath ,Md. Kamruzzaman, D.M. Nuruzzaman , and Md. Shahin Mia 2019 "Analysis and Optimization of Turned Surfaces of AISI 1060 using ANOVA and Regression" University Malaysia Pahang, Malaysia. Vol. 41, No. 1 (2019) 23-32.

[8] AtitayaChaijareenont and SomkiatTangjitsitcharoen 2017"Monitoring of Surface Roughness in Aluminium TurningProcess"ICFMM2017 IOP PublishingIOP Conf. Series: Materials Science and Engineering 303 (2017) 012013.

[9] P.Jayaramana,and L. Mahesh kumar 2014"Multi-response Optimization of Machining Parameters of TurningAA6063 T6 Aluminium Alloy using

Grey Relational Analysis inTaguchi Method"12th global congress on manufacturing and management, GCMM 2014.

[10] A.TorresaPuertasa,and C.J. Luisa 2015"Surface roughness analysis on the dry turning of an Al-Cu alloy"The Manufacturing Engineering Society International Conference, MESIC 2015 Pamplona,Spain

[11] N.M. Vaxevanidisa,N.A. Fountasa, A. Koutsomichalisb, and J.D. Kechagiasc 2018"Experimental investigation of machinability parametersin turning of CuZn39Pb3 brass alloy"1st International Conference of the Greek Society of Experimental Mechanics of Materials, Greece.

[12]Dr. C. J. Rao ,Dr. D. Nageswara Rao, P. Srihari2013"Influence of cutting parameters on cutting force and surface finish inturningoperation"International Conference On design and manufacturing, IConDM 2013

[13] Puneet Bansal andLokesh Upadhyay 2016"Effect of Turning Parameters on Tool Wear, Surface Roughness andMetal Removal Rate of Alumina Reinforced Aluminum Composite"3rd International Conference on Innovations in Automation and Mechatronics Engineering,ICIAME 2016.

[14] Rajendra B and Deepak D 2015 "Optimization of Process Parameters for Increasing MaterialRemoval Rate for Turning Al6061 Using S/N ratio''International Conference on Emerging Trends in Engineering, Science and Technology (ICETEST- 2015)

[15] Ricardo Augusto Gonçalves and MárcioBacci da Silva [2015] "Influence of Copper Content on 6351 Aluminum AlloyMachinability"Volume 1,Pages 683–69543rd Proceedings of the North American Manufacturing ResearchInstitution of SME,2015.