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Cutting Factor for CNC Turning by Taguchi Method

[1]Akanksha Shrivastava, [2]Dr Amit Bhaheker

[1]PG scholar, Department of Mechanical Engineering, SAGE UNIVERSITY, Indore
[2]Associate Professor, Department of Mechanical Engineering, SAGE UNIVERSITY, Indore

ABSTRACT

A series of machining experiments on test specimens was used to assess the importance of machining parameters in the study, and the Taguchi approach (orthogonal array) was altered for the trials. Utilizing the ideal arrangement of cutting parameters, a confirmation test was run. On the machined samples, the surface defects and other surface damages brought on by the machining operations were assessed. In order to determine the impact of different parameters on the machined surface quality, the relationship between turning parameters and surface roughness is examined in this study. By doing this, actual production time is cut, processing efficiency is implemented, and the amount of resources used during the production process itself is reduced, increasing the process capabilities.

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

INTRODUCTION

Manufacturing organisations are continuously requesting quicker production rates and increased machine capability since quality and productivity are crucial factors in today's industrial sector. The quality of the thing purchased affects how satisfied customers are with the purchased good (or service) (or product). The quality of the products should therefore be a concern for every manufacturing or production facility. In addition to quality, productivity is a different criterion that is closely related to revenue and a company's reputation. The metal-based industry is focusing on raising production levels and enhancing the calibre of machined goods. This necessitates monitoring of every component in every process. It compares the desired machined part parameter to the desired quality level. The article that follows presents a notion for modelling and optimising CNC-based manufacturing processes utilising intelligent techniques. It can be used for almost all common cutting techniques with very modest changes. By doing this, we can make the production process more effective. Better precision, higher output, better quality, machining of intricate and crucial parts, cost optimization and reduction, repeatability, less expensive final goods, and increased profit can all be used to describe this

PROBLEM STATEMENT

A manufacturing engineer or CNC machine setup specialist is frequently asked to draw on the knowledge of the floor staff as well as published shop standards and handbooks when selecting the necessary machining parameters to achieve a defined degree of dimensional accuracy and surface polish. This must be finished on time to reduce manufacturing delays, correctly to prevent errors, and with attention to the quality of the items produced. When a result, in this situation, the engineer or technician should rely on prior knowledge to choose parameters that would probably provide a surface roughness that is lower than the desired level, and perhaps make some parameter adjustments as time permits or quality control requirements arise.

OBJECTIVE OF WORK

The aims in this study are attention on

- To improve the process's cutting parameters, including the depth of cut, feed rate, and spindle speed.
- To determine the influence each process parameter has on surface quality.
- To increase surface roughness and dimension conformity in CNC turning operations while reducing variability in dimensional geometry.
- After the optimal process parameters are finalised, to set up a redundant manufacturing system to enhance process capabilities.

RESULT

Our project's primary goal is to reduce the turning process's surface roughness. In this study, the trials were conducted using a L9 array. By adjusting the machining parameters, the responsiveness, cutting speed, feed, and depth of cut were tested, and the related values are displayed 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			
Surface Roughness value µm	Spindle Speed rpm	Feed rate mm/ rev	DOC mm
1.0264	660	0.012	1.0

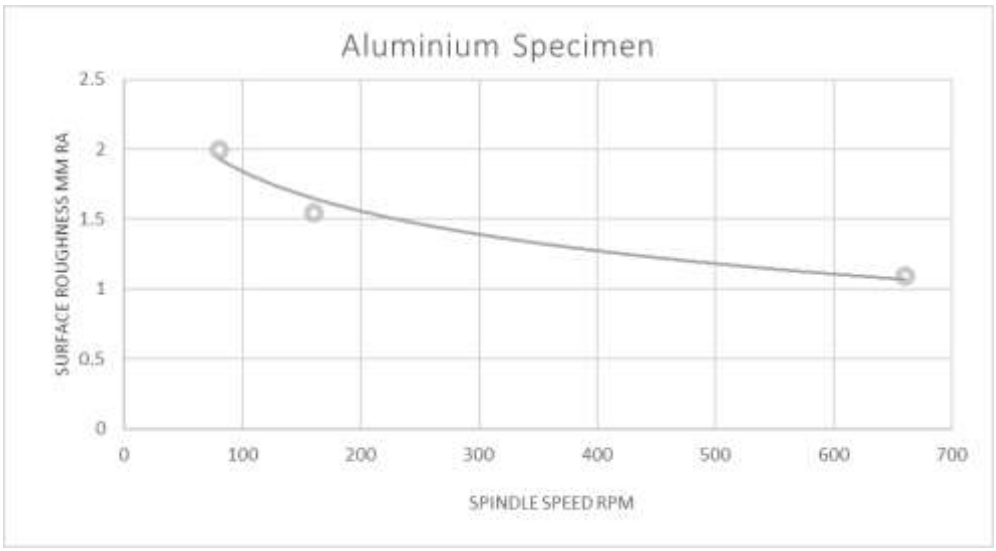

Figure 4.1 Influence of spindle speed to surface roughness over Aluminium specimen

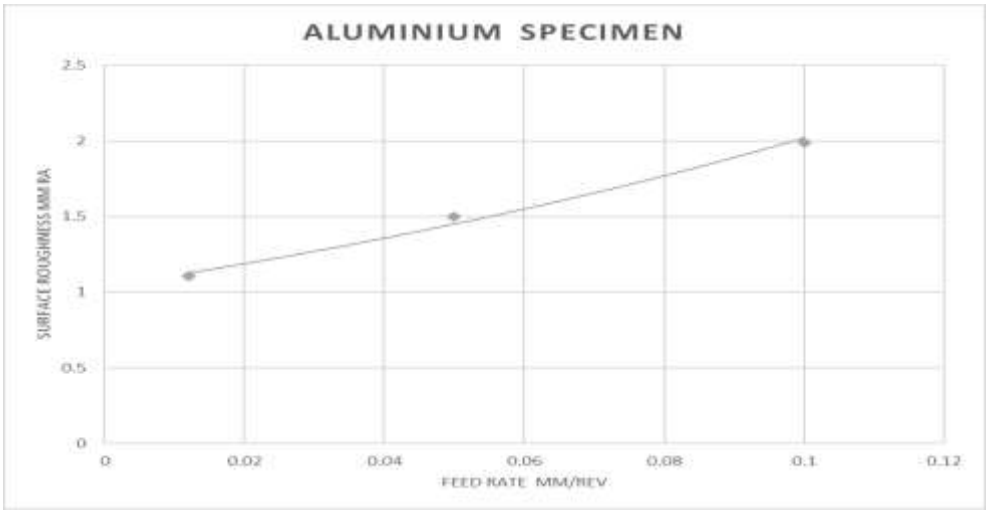

Figure 4.2 Influence of feed rate to surface roughness over Aluminium specimen

Figure 4.3 Influence of spindle speed to surface roughness over Brass specimen

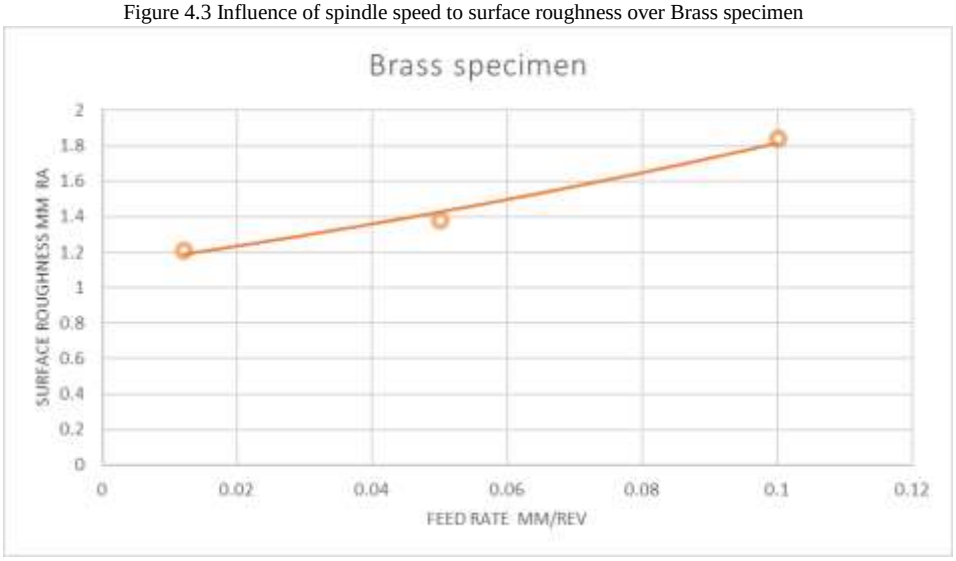

Figure 4.4 Influence of feed rate to surface roughness over Brass specimen

Figure 4.5 Influence of spindle speed to surface roughness over Copper specimen

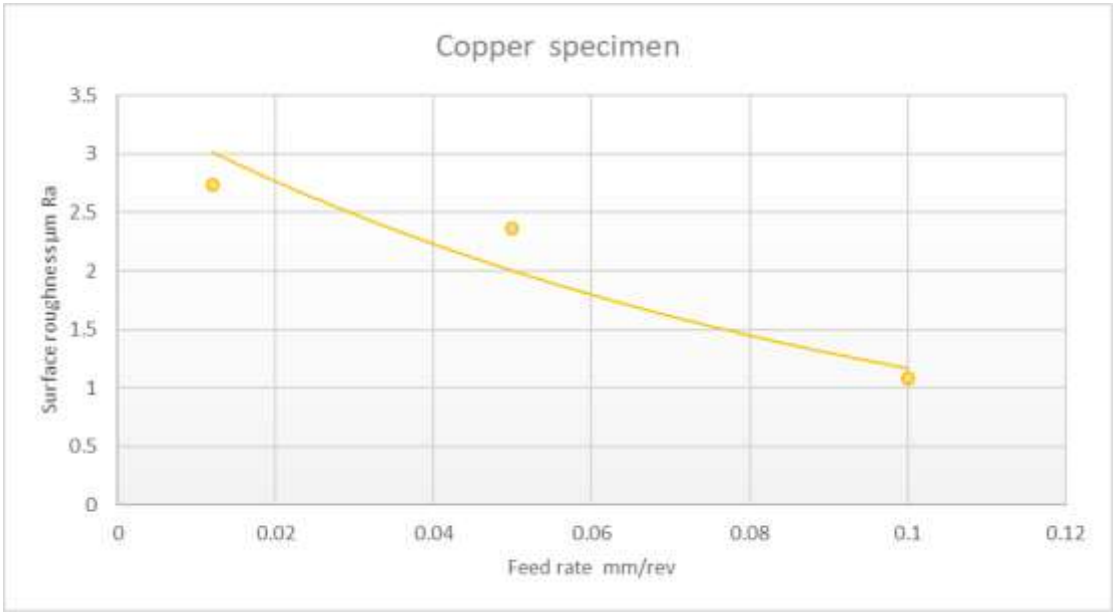

Figure 4.6 Influence of feed rate to surface roughness over Copper specimen

CONCLUSION

The study's findings suggest that process parameters like cutting speed, feed, and depth of cut should be improved for CNC turning of non-ferrous materials (Al & Copper) in order to achieve superior surface polish and geometrical dimensional compliance. In this experiment, the surface roughness was used as the response parameter, while the spindle speed, feed rate, and depth of cut were used as the control (input) parameters.

1) For aluminium, the optimal input parameter setting was found to be spindle speed of 160 rpm, feed rate of 0.012 mm/rev, and depth of cut of 0.5 mm.

2) Spindle speed of 660 rpm, feed rate of 0.012 mm/rev, and depth of cut of 1.0 mm were the input parameter settings that produced the best results when Copper material was turned on a CNC lathe.

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In this study we adopt following recommendations and reference books and articles from Journal**,** to fulfill the objective.

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