

# Parameter Optimization of Turning Process (Cast Iron) Using Taguchi Method

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**Abstract** -This paper focuses on the optimisation of turning parameters using Taguchi technique to obtain minimum cycle time & surface finish. A number of turning experiments were conducted using the L9 orthogonal array on a CNC machine. The experiments were performed on cast iron by using coated carbide insert. Minitab is employed to determined most significant control factor affecting cycle time & surface finish. The cutting speed ,Feed ,Depth of cut were selected as control factors . After the nine experimental trials, It is found that cutting speed is the most significant factor on the Cycle time. Result of the Validation test shows that Taguchi method was notably successful

**Keyword**- Optimization, Turning process parameters ,Taguchi method, orthogonal array, MINITAB-17.

## INTRODUCTION

There is a need for optimizing the process parameter both from technological and economic point of view, optimization of process parameter helps to finding out the correct adjustment of parameter which improve the quality and quantity of the product .This must be done in timely manner to avoid production delay and effectively

Design of experiments and procedure-

Design of experiments and procedure as follows:

Techniques of experimentation- There are different types of experimentation. The most widely used strategies for experimental analysis.

### 1. By guess approach-

In this approach an artificial combination of factors are selected and then tested and its effect on output response is observed. If guessing doesn't produce a desired result the research take another guess for correct combination of factor level. Thus may continue for long period of time without any proper prediction of the combination. If guess is found to be correct at correct at the initial level then it is well and good but still it may not be the best combination

### 2. Pilot experiment-

Pilot experiment is same as guess approach but the difference is that whatever combination is predicted is tested on the actual machine and result are observed if the result are satisfied then the combination

to avoid defect. Therefore in the situation, it is important for the engineering or technician to use past experience to select parameters which willlikely yield a surface finish below that of a specified level and perhaps make some parameter adjustment as a time allows or quality control require.

Engineers and technicians establishing such and operation would ideally consider other implications of setup parameters such as production schedules, processing time and noise factors. A more methodical, or experimental approach to setting parameters should be used to ensure that the operation meets the desired level of quality with given noise condition and without sacrificing production time. As we are dealing with the cycle time and surface finish, low speed affect the cycle time and higher depth of cut damage the surface.

In order to optimize such an operation with such restrictions, a more efficient experiment method is needed. An excellent solution to this issue is an approach known as Taguchi Parameter Design.

may be valid. Mostly pilot experiment depends upon the type of machine capacity and other important factors.

### Taguchi based design of experiment-

Among the various method available, Taguchi method is one of the most powerful and best method in short simple but smart method for analysis. It is widely used in many fields. In application and development of new process and product in quality control.

The salient feature of method are:

- A simple, smart and efficient method optimise process to improve the performance and productivity or reducer cost.
- It gives best parameters for the optimal condition with least number of analytical invention.
- Therefore Taguchi method has great potential in area of low cost experiments.

# Optimization Of Turning Parameters Using Taguchi Method

**Wen Pei Sung, Jimmy Chih Ming  
Kao, Ran Chen**



## **Optimization Of Turning Parameters Using Taguchi Method:**

**Optimization of Turning Process** Prafull P Shirpurkar, Subhash Namdeo Waghmare, Praful T Date, 2019-02-28 The book contains Optimization of Multi response of Turning Process Parameters by Using Tool Inserts now a days mostly used optimization technique which is better than single response optimizing technique because all the output is affected at a time by all the input factors The objective of this book is to determine the optimal setting of cutting parameters speed N m min depth of cut d mm feed f mm rev Nose Radius r mm variation amplitude mm sec<sup>2</sup> vibration frequency kHz in Cutting tool inserts to minimize surface roughness Ra and to increase the Tool life In this book the experiment has been carried out on CNC SPINNER 15 lathe in dry Wet and MQL Minimum Quantity Lubrication cutting Condition turning of a commercially used EN 24 grade steel as a work material and carbide insert tool CNMG120408 CNMG120412 This book highlights use of Taguchi experiment design to optimize the multi response parameters on turning operation For this experiment Taguchi design of experiment was carried out to collect the data for surface roughness and tool vibration The results indicate the optimum values of the input factors and the results are conformed by a confirmatory test This book describes use and steps of Taguchi design of experiments and orthogonal array to find a specific range and combinations of turning parameters like cutting speed feed rate and depth of cut Nose Radius and Cutting condition to achieve optimal values of response variables like surface roughness tool life material removal rate in turning of Split Bush of EN24 Material **Recent Advances in**

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Reddy, Rajagopal Dhanasekaran, 2020-10-30 This book consists of peer reviewed proceedings from the International Conference on Innovations in Mechanical Engineering ICIME 2020 The contents cover latest research in all major areas of mechanical engineering and are broadly divided into five parts i thermal engineering ii design and optimization iii production and industrial engineering iv materials science and metallurgy and v multidisciplinary topics Different aspects of designing modeling manufacturing optimizing and processing are discussed in the context of emerging applications Given the range of topics covered this book can be useful for students researchers as well as professionals Communication, Smart

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**Sinhgad Technical Institutes Campus International Conference on Innovative Practices in Engineering Technology and Business Management** Dr. Sharad Mulik, 2023-01-06 The impact of cutting parameters in the confronting procedure for the most part influences the Tool life and Production time of item The developing rivalry for higher

profitability with great surface finish has made the need of utilizing top notch machining instrument. The significant cutting parameters in confronting process chiefly cutting speed, feed rate, depth of cut influence the Tool life and Production time of the completed material. This paper reviews the streamlining of cutting parameters in confronting process utilizing Taguchi method. An exceptionally structured symmetrical exhibit of Taguchi is utilized to examine the impact of slicing parameters through the modest number of analyses. Taguchi technique is an integral asset of improvement. ANOVA is utilized to discover which input parameters altogether influence the execution attributes. Sign to Noise S/N proportion is utilized to gauge the varieties of test information.

**1 INTRODUCTION** Turning is a machining procedure used to get the ideal element of round metal. The primary objective in present mechanical period is to create minimal effort quality item with required measurements in an optimum time. Therefore the optimum cutting parameters are to be perceived first. In turning the metal is in rotational movement and a cutting tool is utilized to shear away the undesired metals. This procedure requires lathe machine or turning machine, cutting tool, work piece and fixture. The work piece is fixed in the machine chuck and is pivoted at rapid. The cutting tool is taken care of in corresponding to the hub of turn. During this machining procedure the cutting parameters profoundly relies on the work piece, cutting tool material and so on. These are dictated by understanding or machine catalogue. Surface roughness, Tool life and machining time is a widely used attribute of product quality and in most cases a technical necessity for mechanical products. Thus the optimum selection of cutting parameters such as feed rate, depth of cut, cutting speed etc generates optimum conditions during machining and becomes the main exigency of manufacturing industry. Surface roughness, Tool life and machining time is an important criterion to find the quality of a surface. It is an important response parameter. In machining process various parameters are Input Parameters: Cutting speed, Feed rate, Depth of cut, Insert radius, Cutting fluid etc. Output Parameters: surface roughness, Tool life and machining time.

### **Proceeding of 6th International Conference on Advances in Manufacturing and Materials Engineering**

Md Abdul Maleque, 2025 Zusammenfassung. This book presents the proceeding of 6th International Conference on Advances in Manufacturing and Materials Engineering ICAMME 2024 August 13-14 Kuala Lumpur Malaysia. It presents articles in topics that outline the state of the art information in manufacturing and materials engineering for academia and industries. The topics represent the strong synergy between manufacturing materials design and management supporting the transition from product service systems to life cycle engineering services as a contributor to high value manufacturing. The scope of this book also presents a set of new additive manufacturing, 3D printing and advanced materials with new technology, green technology for United Nations SDGs, modeling and simulation of materials and manufacturing with some classical case examples. It caters to academics and industrial practitioners who have research interests in the latest advances in manufacturing and materials engineering. *Materials, Design, and Manufacturing for Sustainable Environment*

Santhakumar Mohan, S. Shankar, G. Rajeshkumar, 2021-02-06. This book comprises the select proceedings of the International

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*Multi Objective Optimization using Grey Taguchi Method* , This study investigated the optimization of CNC turning operation parameters for Copper using the Grey relational analysis method In turning process parameters such as cutting tool geometry and materials depth of cut feed rates cutting speeds as well as the use of cutting fluids will impact the MRR and machining properties like surface roughness The controllable input parameters were Speed RPM Feed mm rev and Depth of Cut mm Twenty Seven experimental runs based on an orthogonal array of Taguchi method were performed The properties of Surface Finish and Material Removal Rate were selected as the quality targets or the response variables An optimal parameter combination of the turning operation was obtained via Grey relational analysis By analyzing the Grey relational grade matrix the degree of influence for each controllable process factor onto individual quality targets can be found The optimal parameter combination is then tested for accuracy of conclusion with a test run using the same parameters

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