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A REVIEW ON OPTIMIZATION OF CUTTING PARAMETERS USING TAGUCHI METHOD.

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ABSTRACT- *Taguchi Method is a statistical approach to optimize the process parameters and improve the quality of components that are manufactured. The objective of this study is to illustrate the procedure adopted in using Taguchi Method to a lathe facing operation. The orthogonal array, signal-to-noise ratio, and the analysis of variance are employed to study the performance characteristics on facing operation. In this analysis, three factors namely speed; feed and depth of cut were consideredThe input of the model consists of feed rate, cutting speed and depth of the cut while the output from the model is the Tool life which is calculated by Taylor's tool life equation. This research is to test the collecting data by Taguchi method*

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Keywords:- *Design of Experiments, Facing Operation, Optimisation, Taguchi Method*

I. Introduction

Taguchi method is a statistical method developed by Taguchi and Konishi [1]. Initially it was developed for improving the quality of goods manufactured (manufacturing process development), later its application was expanded to many other fields in Engineering, such as Biotechnology [2] etc. Professional statisticians have acknowledged Taguchi's efforts especially in the development of designs for studying variation. Success in achieving the desired results involves a careful selection of process parameters and bifurcating them into control and noise factors. Selection of control factors must be made such that it nullifies the effect of noise factors. Taguchi Method involves identification of proper control factors to obtain the optimum results of the process. Orthogonal Arrays (OA) are used to conduct a set of experiments. Results of these experiments are used to analyze the data and predict the quality of components produced. Here, an attempt has been made to demonstrate the application of Taguchi's Method to improve the surface finish characteristics of faced components that were processed on a lathe machine. Surface roughness is a measure of the smoothness of a products surface and it is a factor that has a high influence on the manufacturing cost. Surface finish also affects the life of any product and hence it is desirable to obtain higher grades of surface finish at minimum cost.

II. Taguchi Method

The Full Factorial Design requires a large number of experiments to be carried out as stated above. It becomes laborious and complex, if the number of factors increase. To overcome this problem Taguchi suggested a specially designed method called the use of orthogonal array to study the entire parameter space with lesser number of experiments to be conducted. Taguchi thus, recommends the use of the loss function to measure the performance characteristics that are deviating from the desired target value. The value of this loss function is further transformed into signal-to-noise (S/N) ratio. Usually, there are three categories of the performance characteristics to analyze the S/N ratio. They are: nominal-the-best, larger-the-better, and smaller-the-better.

- Designing products/processes so as to be robust to environmental conditions.
- Designing and developing products/processes so as to be robust to component variation.
- Minimizing variation around a target value

III. Steps Involved in Taguchi Method

The use of Taguchi's parameter design involves the following steps [3].
a. Identify the main function and its side effects.
b. Identify the noise factors, testing condition and quality characteristics.
c. Identify the objective function to be optimized.

d. Identify the control factors and their levels.
e. Select a suitable Orthogonal Array and construct the Matrix
f. Conduct the Matrix experiment.
g. Examine the data; predict the optimum control factor levels and its performance.
h. Conduct the verification experiment.

$$S/N = -10\log(MSD)\begin{cases} -10\log\left[\frac{1}{n}\sum_{i=1}^{n}\frac{1}{y_i^2}\right], & \text{if LTB,} \\ 10\log\left[\frac{\bar{y}^2}{S_y^2}\right], & \text{if NTB,} \\ -10\log\left[\sum_{i=1}^{n}\frac{y_i^2}{n}\right], & \text{if STB.} \end{cases} \quad (1)$$

IV. FUTURE WORK

Material like short carbon austenitic stainless steel are use in industries for the special applications. Very small carbon pleased in austenitic stainless steel AISI 904L make machining environment gummy and results in rapid tool wear. Chip deletion (continuous chip) is hard in machining. reduced machinability and high material cost of AISI 904L is also one of the reason for a lesser amount research work. elevated contents of chromium, nickel, molybdenum and copper, AISI 904L has fine resistance to general corrosion particularly in sulphuric and phosphoric acid situation. Therefore studies on machinability must be approved out by manufacture use of the proven experimental mean procedure. No work is done on value parameters like MRR, surface roughness for facing, power spending etc. Taguchi approach help to decide optimal parameter condition for obligatory output with help of lesser number of experiment (with help Orthogonal Array) & ANOVA approach help to determine which parameters is most significant. ACKNOWLEDGEMENT This paper bears impart of many people. It is joyful incident for all of us to publish our paper. I would like to express my deep sense of gratitude to my guide, teachers and friends for giving valuable time, valuable leadership which helped us in completion of paper productively.

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VI . CONCLUSION

In this work, attempt has been made to present a literature review on optimization of cutting parameters of different engineering materials for surface roughness in turning process. From literature it is observed that Surface roughness isthe most significant response parameter at the point of view quality of the product so most of the researchers have takenit into investigation. Input parameters (Controllable factors) such as cutting speed, depth of cut, feed rate, and spindlespeed are mainly taken for investigation. From investigation it is found that feed rate is the most significant parameterfor surface roughness and also optimal combination of Input parameters is important for good surface finish.Future research work can be done on further optimization of cutting parameters. In turning process material of cuttingtool or insert is an important factor at the point of surface finish. Here more practical options are available to usedifferent types of cutting inserts with varying tool nose radius for future work. Also future work can be done ondifferent engineering material with different response parameters like Material removal rate (MRR), Tool wear, CuttingForce, Power consumption, Machining time (Cycle time) etc.

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