OPTIMIZATION OF PROCESS PARAMETER FOR TURNING OPERATION USING TAGUCHI METHOD – A REVIEW

Suhas A. Rewatkar[1], Dinesh I. Dwivedi[2], Chandan H. Rai[3], Mohit P. Pandey[4]

[1]Asst. Professor, Department Of Mechanical Engineering,
JD College of Engineering & Management Nagpur – 441501, Maharashtra
[2, 3, 4] UG Scholar, Department Of Mechanical Engineering,
JD College of Engineering & Management, Nagpur – 441501, Maharashtra

ABSTRACT: *The aim of this paper to review the Taguchi method is used to find the best process parameters and Improved quality results. Taguchi method can reduce the trial and error type experiments by using a matrix design. The higher production rate can be achieved by optimal selections of process parameters during of a product by implementing Taguchi method .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 considered.This technology has met the current needs of industry owing to its shorter design cycles and improved the design of quality.*

KEYWORD: Surface Roughness, Orthogonal Array, ANOVA analysis, S/N Ratio, Taguchi Method.

I. INTRODUCTION

The Taguchi method involve reducing the variation in a process through robust design of experiment. The overall objective of the methods is to produce high quality product at low cost to the manufacture. The Taguchi method was developed by Dr.Genichi Taguchi of Japan who maintained that variation. CNC turning is one of the most popular and efficient machining operations with which, the high surfaces finish and dimensional accuracy of work piece can easily be obtained. Surface roughness is an essential requirement in determining the surface quality of a product. Surface roughness is a measure of irregularities on the surface of a component resulting from machining operations. The controlled parameters in a turning operation that under normal conditions affect surface finish most profoundly are feed rate and cutting speed. Recent studies, that explore the effect of setup and input parameters on surface finish, find that there is a direct effect of feed rate whereas the spindle speed's effect is generally nonlinear and often interactive with other parameters, and that depth of cut can have some effect due to heat generation The Taguchi methods the best used when there is an intermediate number of variables (3 to 50), few interaction between variables, and when only a few variables contribute signification. Orthogonal Arrays (OA) are used to conduct a set of experiments.. In Taguchi method, S/N ratio has been used to measure the quality of characteristic deviating from the desired value. As mentioned earlier, there are three categories of performance characteristic, namely, lower-the-better, higher-the-better, and nominal-the-better. Analysis of Variance (ANOVA) is a statistical method used to test differences between two or more means. It may seem odd that the technique is called "Analysis of Variance" rather than "Analysis of Means." Analysis of variance on the collected data from the Taguchi design experiments can be used to select new parameter values to optimize the performance characteristic. The data form the arrays can be analysed by plotting the data and performing a visual analysis. In this article the specific steps involve in the application of Taguchi method will be describe an example of using the Taguchi method to design experiment will be given.

II. DESIGN OF EXPERIMENT

Define the process objective, or more specifically, a target value for a performance measure of the process. This may be a flow rate, temperature etc. The target of the process may also be a minimum or maximum; for example, the goal may be to be maximize the output flow rate.

2.1- Create orthogonal arrays for the parameter design indicating the number of and conditions for each experiments. The selection of orthogonal arrays is based on the number of parameters and the levels of variation for each parameter, and will be expounded below.

2.2- Conduct the experiment indicated in the effect completed arrays to collect data on the effect on the performance measure. Complete data analysis to determine the effect of the different parameter on the performance measure.
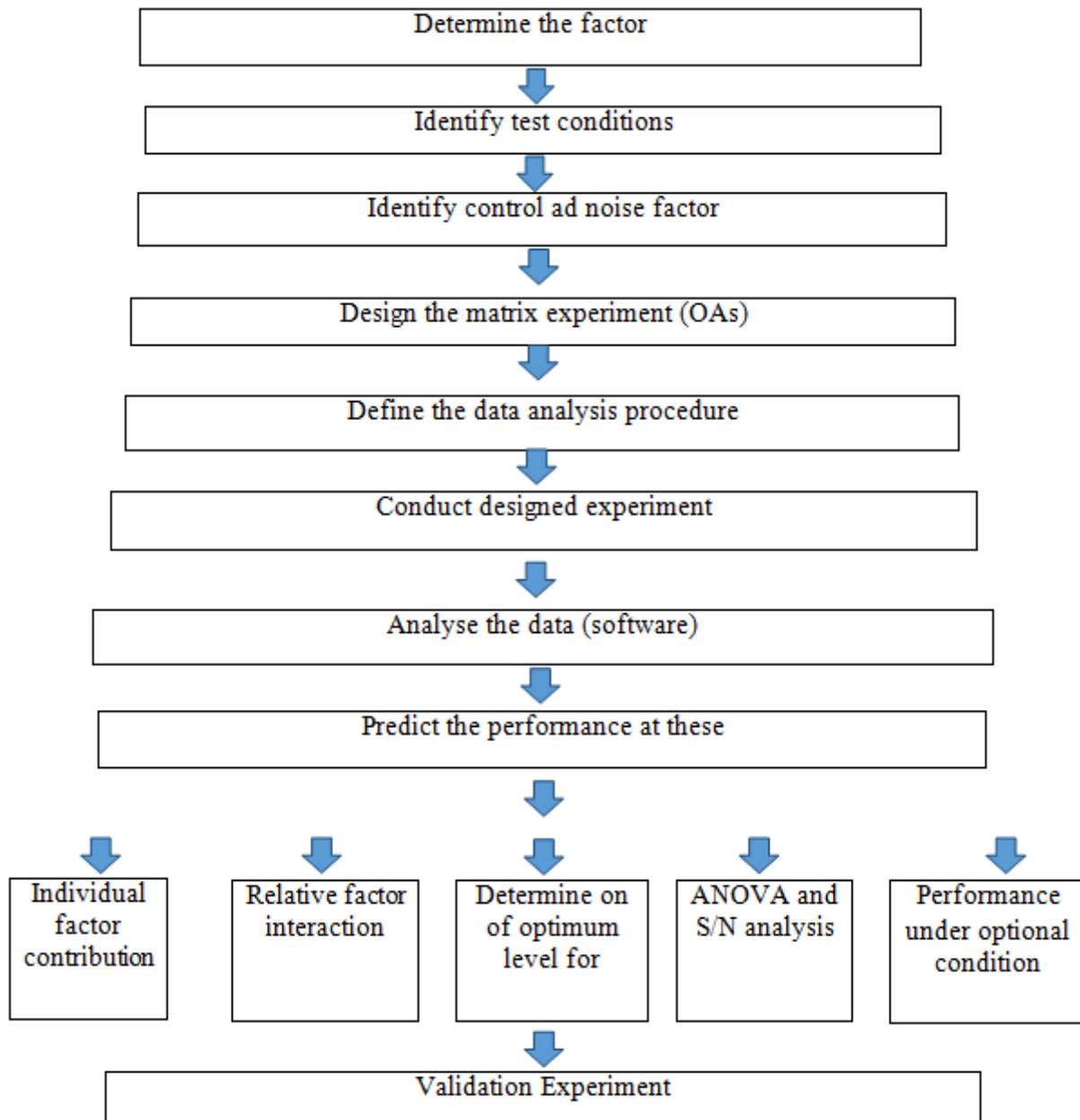
III. TAGUCHI METHOD

3.1- TRIAL-AND-ERROR APPROACH: Performance a series of experiment each of which gives some understanding. This requires making measurement after every experiment so that analysis of observed data will allow him to many a times such series does not progress much many a times.

3.2- TAGUCHI METHOD : Dr. Taguchi of Nippon Telephones Telegraph Company , Japan has develop a method based on "ORTHOGONAL ARRAY "(OA) provide a set of well balanced (minimum) experiments and Dr. Taguchi Signal-to-Noise ratio which are long function of desired output serve as objective function for optimization help in data analysis and predication of optimum results .

IV. TAGUCHI MULTI- OBJECTIVE OPTIMIZATION

In case of multi-objectives results and perform analysis to:
- Determine factor influence (Main Effect).
- Identify significant factors (ANOVA).
- Determine optimum condition and estimate performance.
- Calculate confidence interval of optimum performance.
- Finally, the process parameters can be verified by confirmation test.

VI. CONCLUSION

In most of the industries the turning process parameters and surface roughness on the job/work piece depends upon the skill, experience and mentality of the operators therefore it is very necessary to optimize the turning process parameters, so that minimum surface roughness can be attain to obtain the maximum surface roughness. Optimizing cutting parameters like cutting speed, spindle speed, feed rate, depth of cut, etc. Among all these methods it is observed that Taguchi Method is the most widely used method. Finally, the optimum combinations of parameters are achieved by confirmation tests were conducted to verify the results are experimentally obtained.

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