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Optimization of Cutting Parameters for facing Operation – A review Using Taguchi Method

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Abstract -*In this paper an effort is made to review the literature on optimization of cutting parameters in machining with the assist of Taguchi Method. The mean of this research is to decide the cutting tool and the optimum cutting situation required for the metal cutting of these materials. The significant cutting parameters in turning process mostly cutting speed, feed rate, depth of cut, spindle speed affect the surface finish of the material. Orthogonal arrays of Taguchi, the signal-to-noise (S/N) ratio, the analysis of variance (ANOVA) are employed to find the optimal levels and to study the outcome of the cutting parameter.*

Keywords- *Taguchi method, Signal to noise ratio, ANOVA, Optimization, Cutting Parameters*

I. INTRODUCTION

The require for selecting and implementing optimal machining conditions and the mainly proper cutting tool has been felt over the previous few decades. In machining, the speed and movement of the cutting tool is particular through few parameters. These parameters are selected for every operation based upon the, tool material, work piece material I, tool size, and lots of other. Machining parameters that can influence the processes are :, 1) Feed rate – The speed of the cutting tool's movement comparative to the work piece as the tool makes a cut. The feed rate is calculated in mm per revolution. 2) Cutting speed – The speed of the work piece surface comparative to the edge of the cutting tool through a cut, The cutting speed is calculated in meter per minute. 3) Depth of cut – The depth of the tool next to the radius of the work piece as it makes a cut, as in a turning or boring operation. A huge depth of cut will involve a low feed rate, or else it will result in a high load on the tool and reduce the tool life. so, a characteristic is often machined in some steps as the tool moves over at the depth of cut.

II. TAGUCHI METHOD

Taguchi methods are geometric methods, or at times called robust design methods, developed by Genichi Taguchi to develop the quality of affected goods, and additional recently also apply to engineering and which create high-quality products with low progress and manufacturing costs. Signal to noise ratio and orthogonal array are two main tools used in robust design. The S/N ratio characteristics can be separated into three categories when the characteristic is constant a) Smaller is the better b) Nominal the best c) Larger is better characteristics. The influence of every control factor can be more obviously presented with response graphs. Optimal cutting conditions of control factors can be very effortlessly determined from S/N response graphs. Parameters design is the main step in Taguchi method to get reliable outcome without increasing the experimental expenses.

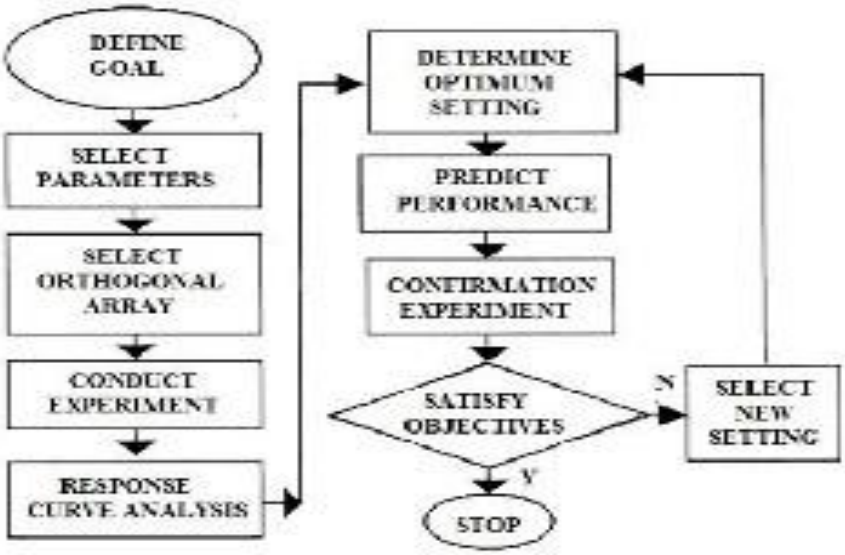

Fig. 1 Flow Chart of Taguchi Method

The Taguchi method is separated into three categories: The system design, the parameter design and the tolerance design. Among these, the parameter design is the most important and used group for civilizing the presentation characteristics lacking growing the costs. The S/N ratio is in use to study the experimental results obtained from the orthogonal array design. The S/N ratio has three presentation characteristics, in Equation (1) to (3) to obtain the best process situation: The smaller-the-better (S/N) SB, the larger-the-better (S/N) LB and the nominal-the-best (S/N) NB. ANOVA is apply to recognize which method conditions extensively affect the performance characteristics. A confirmation test was conducted to confirm the correctness and efficiency of the preferred values achieved for the optimum process condition.

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

III. CONCLUSION

From the beyond literature review we experiential that nearly all of the researcher have taken input parameters (controllable factors) : cutting speed, feed rate and depth of cut and only not many researcher taken input parameter : nose radius, coating thickness of cutting tool, hardness, environment and output parameters : Cutting force, surface roughness, material removal rate (MRR), tool wear, average flank wear, power consumption and machinability. We also establish that for surface roughness the nearly all significant parameters are speed, feed and nose radius and slightest significant parameter is DOC and for MRR the mainly significant parameters are DOC, feed and speed and slightest significant parameter is nose radius.

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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