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TO OPTIMISE MATERIAL REMOVAL RATE ON CNC TOOLS AS PER DESIRED SURFACE ROUGHNESS BY TAGUCHI METHOD :A REVIEW

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Abstract

This is the demand of modern industries to get a good quality product at a valuable cost. Modern day technology like CNC increases production rate and it increases rapidly due to the automation of modern machines any erroneous selection of cutting parameters will result in a huge loss of production cost. And there are different parameters that affect the quality and quantity of processes. In this research paper, we fundamentally examine some standard parameters such as feed rate, cutting depth, cutting speed and lubricants to define a standard condition for reaching surface roughness desired and the tool life. The calculation of these parameters is done using the Taguchi method and the ANOVA approach. The purpose of this to optimise MRR.

Keywords: *turning, material removal rate, surface roughness, Taguchi technique*

1. Introduction

Today, the maximum cutting operation is performed on CNC machines which give a high production rate compared to conventional machining.

But in case the product is reached with poor surface finish and very waste material in the form of chips then it will also affect the total cost of machining and the product should be expensive economical. For this purpose, to optimize these parameters by analysing certain cutting conditions and applying on the operation of CNC machining to obtain a good cutting condition for better surface roughness and should also reduce the total cost the machining And it will increase the production rate of machining at an optimal rate. Machining is the manufacturing process (usually a secondary process) the parts formed either by casting usually pass through machining as well. It involves forcing a harder material cutting tool through the excess material on the work piece. Excess work piece material is removed in the form of chips due to the relative movement between the tool and work piece material. The operation ultimately results in a transformed product of desire size and surface finish. It is very important to design these parts in such a way that this would lead to an increase in the efficiency of the machining process, the improvement of the tool life and the reduction of the overall cost of machining.

To achieve the objectives, a brief knowledge of the different machining processes is necessary. Hard turning is a method that can be used to remove unwanted material from hardened steel in order to get its required shape and size. The temperature generated during hard turning is significantly higher compared to conventional machining. Metal cutting and turning, turning is a machining process to produce round pieces shaped by a single point tool on the towers. The tool feeds either linearly in the parallel direction or perpendicular to the work piece rotation axis, or along a specified path to produce complex rotational shapes. The primary cutting movement in the turning is the rotation of the work piece,

and the secondary movement of the cutting is the feed movement.

In this analysis, we essentially perform machining by changing the different cutting conditions such as power supply, cutting depth, cutting speed of the single point cutting tool. And we will conclude the effect and optimise the rate of removal of materials according to the desired surface roughness. There are also different parameters that will affect the cutting State but we should not consider these parameters.

For cutting hard materials, the tool must also contain certain desired properties such as hardness, toughness, wear resistance, etc.

The optimization of the removal rate of materials and surface roughness is calculated according to the method proposed by Taguchi. By this method, we need to optimize the cutting State and it will reduce the total cost of cutting and waste of materials in industries by performing cutting operation on jobs at a standard cutting State.

2. RESEARCH METHODOLOGY

The analysis of these machining parameters is done using the Taguchi method.

There are different steps in the Taguchi method as follows:

Step-1 To identify quality characteristics or objective function to optimize and process parameters. Brainstorm, flowchart, and cause-effect diagrams are the suggested methods for determining the parameter to be included in an experiment.

Step-2 To identify levels of control factors or process parameters. Total degrees of freedom of experimentation are a direct function of the total number of trials. If the number of levels of a parameter increases, the DOF parameter will also increase as a DOF of a parameter is the number of levels minus one. Therefore, increasing the number of levels for a parameter increases the total degree of freedom in the experiment, which in turn increases the total number of tracks.

Step-3 Orthogonal matrix selection (OA): when a given OA is selected for an experiment, the following condition must be met: total degree of freedom of OA = total DOF is required for parameters and interactions.

Total degree of freedom of OA = N-1 where, N is the number of trails.

The degree of freedom for parameter interactions is the product of the degree of freedom of individual parameters.

Step-4 Experiments and data collection: the experiment is performed for each trace state of the OA matrix. Each experiment in a test condition is repeated in order to reduce the probability of error due to noise factors. Randomization should be performed to reduce bias in the experiment.

Data analysis step-5: There are many methods that have been suggested by Taguchi for analysing data such as ANOVA, ANOVA S/N, average response diagram, etc.

Step-6Determines the average prediction and confidence level. In the prediction of the average and confidence intervals are the two optimization methods in which the optimal value is found, or it is between these two and the value of the confidence interval is always less than the expected value. Then, the value that will satisfy this condition is the optimal value.

Step-7 The last step is the confirmation experience. The confirmation experiment is the last step to check the conclusions of the previous experimentation cycle. The optimal conditions are set for meaningful parameters and a selected number of tests are executed under specified constant conditions. The average of the results of the confirmation experiment is compared to that expected results.

3. CONCLUTION

In this Article, different Process parameters from the Conclusions of the experimental Experiment study Areanalyzed: The Process parameters influence a different Reaction. Therefore, You need to set the Parameter according to the Request.

The Maximum MRR is achieved at a specified Speed , Power and Cut Depth . The Roughness of the Surface is Also increasing with increasing Speed.

The MRR increases with the Increase in speed, Progress and Depth. And Surface Roughness increases with the Increase in speed. During Supply, surface roughness Decreases and during the Increase in Cut depth up to a certain Surface

roughness, it decreases and rises beyond the Limit.

The Speed and Depth of Cutting are the main Control Factor of MRR and the Speed is the main Control of Surface Roughness factor, while the Force and Depth reduce the ARA less significant Factor for Roughness area.

4. References

1. MaharshiPatel,Prof. Jignesh Patel, Prof. Swaraj Darji,"An Analyse of Optimum Parameter on Cutting Force and Surface Roughness by TAGUCHI Method during Turning on EN9 (Hard Steel)"IJSRD - International Journal for Scientific Research & Development| Vol. 1, Issue 3,2013

2.Sunil, Jagdipchauhan, "A Review-Optimization of Machining Parameters in Turning Operation by Employing Taguchi Method"IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 03, 2015

3.Ankush Singlaand Taljeet Singh, "Optimization of Process Parameters on CNC Turning"International Journal of Current Engineering and Technology E-ISSN 2277 – 4106, P-ISSN 2347 – 5161 , 2016

4.Yogender kumar and Jagdip Chauhan, "A Review Paper on Optimization of Surface Roughness, Material Removal Rate and Cutting Tool Flank Wear in Turning by Employing Taguchi Method"IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 03, 2015 |

5.SorabhKasara, "Optimization of Material Removal Rate of Mild Steel Bar using Taguchi Method"IJSRD - International Journal for Scientific Research & Development| Vol. 5, Issue 07, 2017

6.Er. Gurupreet Singh, SardarCharan Singh and Hardeep Singh Maan, "Reviewing the Optimizing Techniques for the Turning Operation of Different Specimen and its various significant Cutting Parameters affecting Surface Roughness using Taguchi Method"IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)Volume 14, Issue 2 Ver. VI (Mar. - Apr. 2017)