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Surface Modifications Of EN 8 Steel With Application Of Various Cutting Fluids During Machining Process

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Abstract: **Turning process, a machining process used in a manufacturing industry. Process of turning is influenced by known factors such as cutting velocity, depth of cut, feed rate, geometry of cutting tool, & cutting conditions etc. In the machining operations, achieving the desired surface quality of a machined product is really challenging job. This is due to the fact that quality is highly influenced by process parameters directly or indirectly. However, the extent of a significant influence of process parameters those are different for different responses. In this thesis the effect of insert nose radius and the machining parameters which including the cutting speed, feed rate and cutting fluids on surface roughness in a turning operation are investigated by using the Taguchi optimization method. 3D modeling done by PRO ENGINEER parametric software. Analysis is done by ANSYS.**

Keywords **-CNC Turing; Surface Finish; Taguchi Optimisation;**

I. INTRODUCTION

The challenge of machining industries was mainly focused on the achievement of a high quality, in terms of work piece - dimensional accuracy, surface finish, is at high production rate, which have got less wear on the cutting tools, the economy of machining in terms of the cost saving and the increase in the performance of a product with reduced environmental impact. Ratio between costs and quality of products in each production stage has to be monitored and immediate corrective actions have to be taken in case of a Deviation from desired trend. The surface roughness measurement presents an important task in many engineering applications. Many life attributes can be also determined by how well the surface finish is maintained. Machining operations have been the core of the manufacturing industry since the industrial revolution and the existing optimization researches to Computer Numerical Controlled (CNC) turning were either simulated within particular manufacturing circumstances or achieved through numerous frequent equipment operations. These conditions or manufacturing Circumstances that are regarded as computing simulations and their applicability to real world industry which is still uncertain and therefore, a general optimization scheme without equipment operations was deemed that to be necessarily developed. The machining process on a CNC lathe is programmed. Many surface roughness prediction systems were designed using a wide variety of sensors that including dynamometers for force and torque.Taguchi and Analysis Of Variance (ANOVA) can be conveniently is to optimize the cutting parameters with severalexperimental runs well designed.

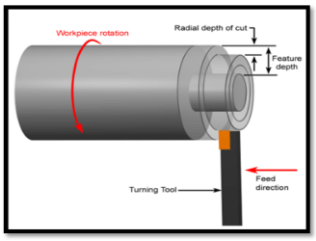


Fig: 1 – Machining of a material during Turning Process

TAGUCHI TECHNIQUE

Taguchi defines Quality Level of a product as the Total Loss incurred by the society which is due to the failure of the product that to perform as a desired one. When it deviates from the delivered target performance levels. This includes costs associated with poor performance, operating costs which changes as a **Taguchi Methods**

SURFACE FINISH

It comprises of the small local deviations of surface from perfectly flat ideal (a true plane).Surface texture is one of an important factors that control friction and transfer layer formation during sliding. Each manufacturing process (such as the many kinds of machining) produces a surface texture. The process is usually optimized to ensure that the resulting texture is usable. If necessary, an additional process will be added to modify the initial texture.

II. METHODOLOGY

In this work, experimental results were used for Optimization of input machining parameters speed, feed, and depth of cut using TaguchiTechnique for the response Surface Roughness. ANOVA is also

used for Predicting the influence of various parameters on Rz.

III. LITERATURE SURVEY

Anil Choubey optimized "Optimization of gadget parameters of CNC Milling device for moderate metal using Taguchi layout and Single to Noise ratio Analysis" [1]. Balinder Singh minimized "Optimization of Input Process Parameters in CNC Milling Machine of EN24 Steel" [2]. N. Gopikrishna and M. Shiva Chander determined the surface roughness in the paper "Determining the Influence of Cutting Fluid on Surface Roughness during Machining of EN24 and EN8 steel by using CNC Milling Machine". [3]. G., Krishna studied and investigated "Selection of Optimum Process Parameters in High Speed CNC End-Milling of Composite Materials Using Meta Heuristic Techniques – a Comparative Study Pare". [4]. B. Satish Kumar and N. Gopikrishna made an investigation in "optimization of turning process parameters, on EN 9 carbon steel using grey relational analysis". [5]. G. Petropoulos, I. Ntziantzias, C. Anghel, made observations in "A predictive model of slicing forces in milling the usage of Taguchi & response floor strategies" [6]. C. Tsao, in his paper, "Grey–Taguchi technique to optimize the milling parameters of aluminum alloy", studied parameters. [7].

Table: 1 – TAGUCHI ORTHOGONAL ARRAY

TAGUCHI ORTHOGONAL ARRAY

JOB NO.	SPINDLE SPEED (rpm)	FEED RATE (mm/min)	CUTTING FLUIDS
1	600	200	SERVO OIL
2	600	200	SUNFLOWER
3	600	200	PLAM KERNOL
4	1200	200	SERVO OIL
5	1200	200	SUNFLOWER
6	1200	200	PLAM KERNOL
7	1800	200	SERVO OIL
8	1800	200	SUNFLOWER
9	1800	200	PLAM KERNOL

Table: 2 – Process parameters

FACTORS	PROCESS PARAMETERS	LE VEL1	LEVEL2	LEVEL3
A	CUTTING SPEED(rpm)	600	1200	1800
B	FEED RATE (mm/rev)	200	200	200
C	CUTTING FLUIDS	SERVO OIL	SUNFLOWER	PLAM KERNOL

Table: 3 – Feed rate varying with spindle speed

FEED RATE (mm/min)	SPINDLE SPEED (rpm)
200	600
200	1200
200	1800

Materials

Work piece –EN 8 steel

Cutting tool –carbide tool

Table: 4 – Surface Roughness Values For Servo Oil

FEED RATE (mm/min)	SPINDLE SPEED (rpm)	SURFACE ROUHNESS(µm)
200	600	4.5
200	1200	3.4
200	1800	2.3

Table: 5 – surface roughness values for sun flower vegtble cutting fluid

FEED RATE (mm/min)	SPINDLE SPEED (rpm)	SURFACE ROUHNESS(µm)
200	600	3.1
200	1200	2.5
200	1800	1.2

Table: 6 – surface roughness values for palm keron oil cutting fluid

FEED RATE (mm/min)	SPINDLE SPEED (rpm)	SURFACE ROUHNESS(µm)
200	600	3.1
200	1200	2.5
200	1800	1.2

IV. EXPERMENTAL SETUP

The work piece material selected for investigation is the EN 8 STEEL. The cutting experiments were carried out on Work piece by CNC Lathe under different cutting conditions that are shown in Table 2. Experimental data of EN 8 STEEL which was used in experiments as shown in the Table 7

Fig: 2 – Machined EN 8 material during Turning Process

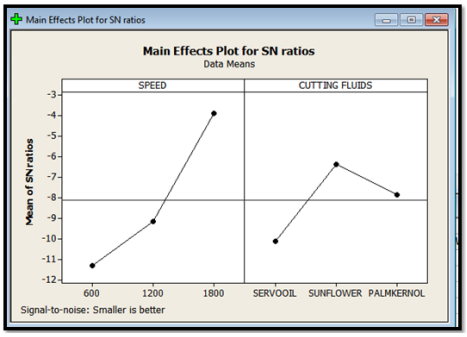
Table: 7 – Surface roughness

JOB NO.	SPINDLE SPEED (rpm)	FEED RATE (mm/min)	Surface roughness (R_z) µm
1	600	200	4.5
2	600	200	3.1
3	600	200	3.1
4	1200	200	3.4
5	1200	200	2.5
6	1200	200	2.5
7	1800	200	2.3
8	1800	200	1.2
9	1800	200	1.2

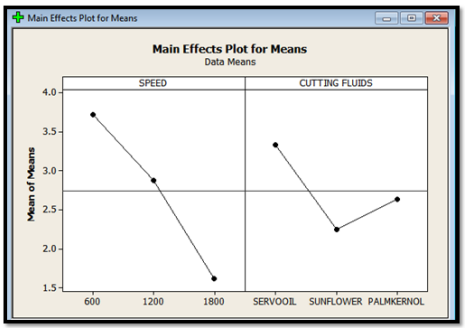
V. RESULTS AND DISCUSSION

In the Taguchi method the results of the experiments are analyzed to achieve one or more of the following three objectives. To establish the best or the optimum condition for a product or a process. To Studying the main effects of each of the factors identifies the optimum condition. The process involves minor arithmetic manipulation of the numerical result and usually can be done with the help of a simple calculator. The main effects indicate the general trend of the influence of the factors. Knowing the characteristic, i.e., whether a higher or lower value produces the preferred result, the levels of the factors, which are expected to produce the best results, can be predicted. Estimate the contribution of individual factors. To estimate the response under the optimum conditions. The knowledge of the contribution of individual factors is the key to deciding the nature of the control to be established on a production process. The analysis of variance (ANOVA) is the statistical treatment most commonly applied to the results of the experiment to determine the percent contribution of each factor. Study of the ANOVA table for a given analysis helps to determine which of the factors need control and which do not. In this study, an L9 Orthogonal array with was used.

Graph 1: EFFECT OF TURNING PARAMETERS ON FORCE FOR S/N RATIO



Graph 2: EFFECT OF TURNING PARAMETERS ON FORCE FOR MEANS



Taguchi method stresses the importance of studying the response variation using the signal–to–noise (S/N) ratio, resulting in minimization of quality characteristic variation due to uncontrollable parameter. The cutting force is considered as the quality characteristic with the concept of "the smaller-the-better". The S/N ratio for the smaller-the-better is:

$S/N = -10 * \log(\Sigma(Y^2)/n))$

Where n is the number of measurements in a trial/row, in this case, n=1 and y is the measured value in a run/row. The S/N ratio values are calculated by taking into consideration above Eqn. with the help of software Minitab 17.

The force values measured from the experiments and their corresponding S/N ratio values are listed in Table

VI. CONCLUSION

In this thesis an attempt to make use of Taguchi optimization technique to optimize cutting parameters during high speed turning of EN 8 tool steel using cemented carbide cutting tool.

The cutting parameters are cutting speed, feed rates for turning of work piece EN 8 tool steel. In this work, the optimal parameters of cutting speed are 600rpm, 1200rpm and 1800rpm, feed rate are 200mm/min,. Experimental work is conducted by considering the above parameters. Cutting forces, surface roughness values are validated experimentally.

The experiment will be conducted above parameters and different cutting fluids such as servo oil, sun flower refined oil and palm kernel oil.

By observing the experimental results and by taguchi, the following conclusions can be made:

To minimize the cutting forces, the optimal parameters are spindle speed – 600rpm, feed rate – 200mm/min and depth of cut – 0.4mm.

To get better surface finish, the optimal parameters are spindle speed – 1800rpm, feed rate – 200mm/min and sunflower refined oil.

So we can conclude that, the better cutting fluid is sunflower refined oil compared to servo oil and palm kernel oil

VII. REFERENCES

[1]. Optimization of gadget parameters of CNC Milling device for moderate metal using Taguchi layout and Single to Noise ratio Analysis ANIL CHOUBEY1, VEDANSH CHATURVEDI2 ,JYOTI VIMAL.

[2]. Optimization of Input Process Parameters in CNC Milling Machine of EN24 Steel 1Balinder Singh, 2Rajesh Khanna, 3Kapil Goyal, 4Pawan Kumar

[3]. N. Gopikrishna and M. ShivaChander Determining the Influence of Cutting Fluid on Surface Roughness during Machining of EN24 and EN8 steel by using CNC Milling Machine, Journal for Research| Volume 01| Issue 11 | January 2016 ISSN: 2395 – 7549 pp 1 – 4

[4]. Selection of Optimum Process Parameters in High Speed CNC End-Milling of Composite Materials Using Meta Heuristic Techniques – a Comparative Study Pare, V., Geeta, G., Krishna, C.M. Vikas Pare – Geeta Agnihotri – Chimata Krishna*

[5]. B. Satish Kumar and N. Gopkrishna optimization of turning process parameters, on EN 9 carbon steel using grey relational analysis – International Journal of innovations in engineering research and technology| Volume 4| Issue 1 | January 2017 ISSN: 2394 – 3696, pp 6 – 10

[6]. G. Petropoulos, I. Ntziantzias, C. Anghel, A predictive model of slicing forces in milling the usage of Taguchi & response floor strategies, a proceeding of 1st InternationalConferenceonExperiments/Process/SystemModelling/Simulation/Optimization, Athens, 6- 9 July, 2005

[7]. C. Tsao, Grey–Taguchi technique to optimize the milling parameters of aluminum alloy, International Journal on Advanced Manufacturing Technology (2009) 40:41–48

