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A Review on Lathe Machine Turning Process Parameter

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Abstract: *The main objective of this study is to improve toughness and hardness of engineering material by changing the machining parameters of turning process. By applying Taguchi method the quality of manufactured goods, and engineering designs are developed by studying variations. Surface finish is one of the vital concerns during machining of various materials in the machining operations. Therefore it is very essential for controlling the required surface quality to have the choice of optimized cutting parameters. Signal-to-Noise ratio were used to study the performance characteristics in turning operation. The results of the analysis show that none of the factors was found to be significant. Taguchi method showed that feed rate followed by depth of cut and spindle speed was the combination of the optimal levels of factors while turning EN24 steel.*

Keywords: EN24, steel, optimized, quality, signal to noise.

Introduction

Globalization of world market creates a challenge in products marketing, due to high competition induces in manufacturing to produce better quality product within a shorter period of time as well as low cost. Precise product could be produced while utilizing the machine as optimum working condition. Optimum machining parameters are of great concern in the manufacturing environment, where the economy of machining operation plays a key role in competitiveness in the market.

1.1 Lathe machine

The lathe machine is used to perform basic tasks such as cutting, drilling, tapping, which turns with the help of various tools placed there. Basic parts of the lathe machine such as base head stock, tail stock, main drive, carriage.

Working principle: A lathe is a machine tool that places a work piece in the centre or in a chuck or face plate between two rigid and strong supports that rotate. The cutting tool is tightly held and supported in a tool post which is fed against rotating work. Due to their extreme capacity, people associated with the metal-work area prefer to designate the lathe as a machine tool. Therefore, the lathe is not a machine; It is a machine tool.

A lathe machine is a machine tool that is used to extract metals from a work piece to give the desired shape and size. In other words, it is a machine that is used to hold a work piece to remove various pieces, such as with the help of turning, grooving, chamfering, knurling, facing, tools.

1.2 Turning operation

A common method to create specific dimension involves the removal of excess material by machining operation by cutting tool. Turning process is the process of remove material from cylindrical and non-cylindrical parts. It is used to reduce the diameter of the work piece, usually to a specified or different diameters.. In its basic form, it can be defined as the machining of an external surface.

- With the work piece rotating.
- With a single-point cutting tool, and

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- With the cutting tool insert parallel to the axis of the work material and at a distance that will remove the excess material of the work.

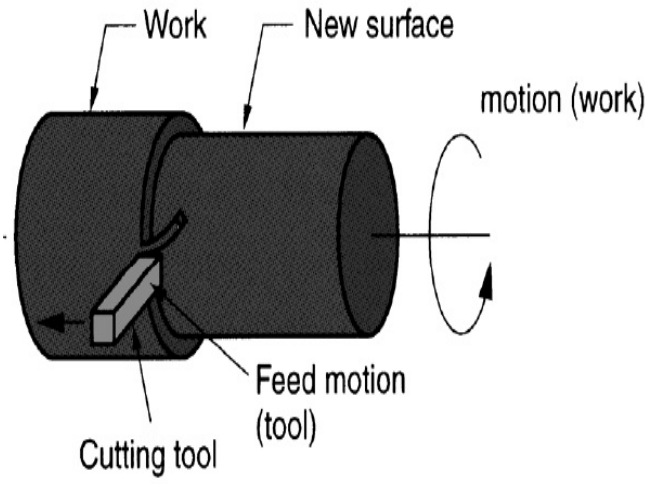

Fig 1: Turning operation.

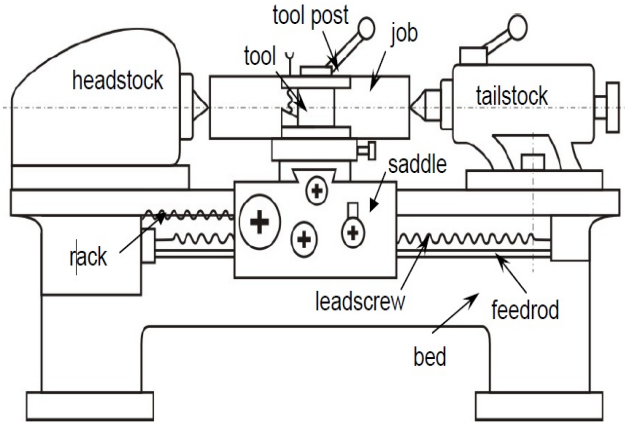

Fig 2: Schematic view of a centre lathe.

II. Literature Review

In this chapter, some references to previous researches are listed below and what the researcher previously worked on.

2.1 Different views

1. AL. Arumugam and R. Ragothsingh (2013) - Turning is one of the common machining methods in manufacturing industry. Hardness of the material is the most significant property in the field of design to satisfy the safety and reliability. The main objective of this investigation is to analyse the changes in the hardness of material on the machined surface due to machining operation (turning) by considering the spindle speed, feed and depth of cut. EN353 forged steel was selected for the analysis to measure the hardness. The hardness was estimated using Rockwell hardness tester by varying the cutting parameters using Taguchi method.

2. Digvijay kushwah and Ravi Ranjan (2017) - The surface finish is one of the prime necessities of clients, for machine parts. This investigation concentrates on improving turning parameters in view of Taguchi technique, to limit surface harshness. Tests have been directed utilizing the L27 orthogonal array in a lathe machine, hard turning of EN-8 steel, utilizing carbide tool in dry condition.The statistical methods of S/N ratio- 'smaller is better'- and the analysis of variance (ANOVA) were applied, to investigate the effects on spindle speed, feed rate and depth of cut on surface roughness. The depth of cut was recognized as the most influential process parameter for minimum surface roughness.

3. Satish Kumar and Ravi Bishnoi (2019) - In the present work, Turning Parameters were optimized using Taguchi Method. Also, the effect of turning parameters such as rotational speed, feed rate, depth of cut and tool nose radius on surface roughness of high carbon steel was investigated. L8Taguchi's method was used for designing the experiments and optimization of turning parameters. Eight experiments were conducted with four factors having two levels for each factor. Results revealed that tool nose radius has a significant effect on surface roughness and it is the most dominating factor affecting the surface roughness with contribution of 99.58 %.

4. Ankit Dogra, Hartaj Singh, Dharampal, Vishal Singh and Sunil Kumar (2016) - In this research the

experiments were performed by using material specimens of EN8 to know the effect of different machining parameters on tool wear. The main objective of this study was to investigate the effect of cutting parameters and the work piece on the tool wear during a machining of EN8 material. The quality of work piece material is main contributing factor as spindle speed, depth of cut and feed rate which may be influence by tool wear through cutting operation. The experimental design was formed based on Taguchi's Technique. An orthogonal array L(3)9 and Analysis of Variance are employed to investigate the turning conditions and machining was done using coated tool.

5. S.Sathiyaraj, A.Elanthiraiyan, G.Haripriya and V.Srikanth Pari (2015) - Surface roughness is one of the important parameter in conventional machining. Optimising these parameters is most challenging task in turning process. In this experiment we consider the parameters of alloy of steel to attain best surface finish. Here we undertake speed, feed and depth of cut as machining parameter. Taguchi method is further implemented to find the various levels of chosen parameter and thus using statistical analysis we find the optimum range of speed, feed and depth of cut to minimize the surface roughness and employed in working model for real time experiment. Here we use work material of EN8 steel and tungsten carbide tipped tool.

6. P. G. Inamdar, N. S. Bagal, V. P. Patil, K. K. Bhosale and V. V. Mane (2017) - The main aim of this paper is to optimise the surface roughness in conventional turning operation using Taguchi Method for the material medium carbon steel EN8. In this work cutting speed, feed rate and depth of cut are taken as performance parameters to achieve better surface roughness. Taguchi Method is used to obtained the main parametric effect on the surface roughness using there levels and factors. L9 orthogonal array is used to design the experiments. Also analysis of variance (ANOVA) was carried out with the significance factor of 95%. After the experimentation, it was found that cutting speed has more influenced on the surface roughness in conventional turning process than feed rate and depth of cut.

7. B.Suresh, Pon.Azhagiri, T.Senthil Kumar and B.Kumarakurubaran (2016) - The present paper is an experimental study to investigate the effect of cutting parameters (cutting speed, depth of cut and feed) surface roughness and material removal rate (MRR) during turning of EN8 steel. Turning experiments were conducted with cutting speeds: 1000,1250,1500 rpm , feeds: 0.1, 0.2, 0.3 mm/rev and depth oh cuts: 0.3, 0.4, 0.5 mm. The experimental layout was designed based on the Taguchi's analysis. Orthogonal array technique and analysis of variance (ANOVA) was performed to identify the effect of the cutting parameters on the response variables. Finally, the relationship between cutting parameters and the performance measures (machining time, surface roughness and material removal rate) were developed by using multiple regression analysis.

8. G. Akhtar, C.H. CheHaron and J.A. Ghani*et* (2008) - In this paper it has been shown that design quality can be improved by improving quality and productivity in companywide activities. Taguchi's parameter design is a very important tool for ROBUST design, providing a simple and systematic approach to optimize a design for cost, performance and quality. The Taguchi optimization method is applied to optimize the cutting parameters in turns.

9. Sijo M. T. and Biju. Ann (2010) - In this research paper the optimization method of Taguchi parameters is applied to cut parameters in bend. Turning parameters evaluated include cut velocity, feed rate, and depth of cut, radius of the tool's nose and stiffness of the material at each of two levels. The results of the analysis show that surface roughness of feed rate, cutting velocity and nasal radius have a less significant contribution to surface roughness at cut depth and material hardness.

10. Dr. SS Chowdhary, SS Khedkar, N.B. Borkar*et* (2011) - The performance of manufactured products is often evaluated by several quality characteristics and reactions and experimental techniques. In the present investigation optimization

model based on the Taguchi technique has been developed to optimize the process point parameters, such as speed, feed, depth of impact, and nose radius of a single point cutting tool. Taguchi's L9 orthogonal array is chosen for the experimental scheme. Experimental result analysis revealed that a combination of cutting speed, cut depth, and lower level of feed is required to achieve maximum, along with reducing material removal rate and surface roughness.

III. Taguchi Method

The common approaches to tackle modeling, and process optimization problem in molding include multiple regression analysis, response surface methodology (RSM) and artificial neural network (ANN) in combination with some optimization algorithm like genetic algorithm (GA), Fuzzy regression model, Swarm intelligence, etc. In most of the cases, the optimization has been performed using single objective function. The major limitation of the aforesaid ethods is the requirement of enormous data for developing an adequate and best-fit model. This results in an increase of experimentation cost and loss of considerable time. If there is an experiment having 4 factors which have three levels, then total number of experiment is 81. Then results of all experiment will give 100 accurate results. In comparison to above method the Taguchi orthogonal array make list of nine experiments in a particular order which cover all factors. Those nine experiments will give 99.96% accurate result. By using this method number of experiments reduced to 9 instead of 81 with almost same accuracy. Taguchi's experimental procedure and analysis consist of several steps .The DOE is sometimes too complex, time consuming and not as easy to use more trials have to be carried out when the number of process factors increases. The Taguchi Method uses special, highly fractionated factorial designs and other types of fractional obtained from orthogonal (balanced) arrays to study the entire experimental region of interest for the experimenter, with the minimum number of trials as compared with the classical DOE, especially with a full factorial design. In Taguchi method, ANOVA is performed to find the effective parameters in turning process.

References:

[1] AL. Arumugam R. Ragothsingh (2013) "Optimization of Turning Process Parameters for Hardness in Forged Steel" International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 12, PP- 2401-2405.

[2] Digvijay kushwah and Ravi Ranjan " Evaluation and optimization of cutting for parameters parameters turning of EN 8 steel. A Taguchi Appproach." International Journal of Mechanical Engineering (IJME) Vol. 6, Issue 4, PP- 35-44.

[3] Satish Kumar and Ravi Bishnoi (2019) "Optimization of Turning Process Parameters using Taguchi Method" International Journal For Technological Research In Engineering Volume 6, Issue 11, PP – 5800-5803

[4] Ankit Dogra, Hartaj Singh, Dharampal, Vishal Singh and Sunil Kumar (2016) "Optimization of Turning Parameters of En-8 Steel Cylindrical Rods Using Taguchi Methodology" International Journal for Research in Applied Science & Engineering Technology (IJRASET). Volume 4 Issues XII, PP-97-103.

[5] S.Sathiyaraj, A.Elanthiraiyan, G.Haripriya and V.Srikanth Pari (2015) "Optimization of machining parameters for EN 8 steel using Taguchi Method" ICRAMET, Special Issue 9, ISSN: 0974-2115, PP-157-161.

[6] P. G. Inamdar, N. S. Bagal, V. P. Patil, K. K. Bhosale and V. V. Mane (2017) "Optimization of Surface Roughness in Turning Operation of EN8 using Taguchi Method" International Advanced Research Journal in Science, Engineering and Technology, Vol. 4, Special Issue 1, PP-127-132

[7] B.Suresh, Pon. Azhagiri, T.Senthil Kumar and B. Kumarakurubaran (2016) "Experimental Investigation on Surface Roughness and Material Removal Rate during Turning of EN8 Steel" International Journal of Emerging Technologies in Engineering Research (IJETER) Volume 4, Issue 6,PP-142-154.

[8] G. Akhtar, CheHaron C.H., Ghani J.A. (2008) "Application of Taguchi methodology in optimization of turning parameters for surface roughness". International Journal of Science Engineering and Technology Vol. 1, No. 3, PP-60-66

[9] Sijo MT and Biju N, 2010, "Taguchi method for optimization of cutting parameters in turning operations" AMAE.2010.01.536 PP-103-105.

[10] ChowdharyDr. SS, Khedkar SS, Borkar N.B. "Optimization of process parameters using aguchi approach with minimum volume lubrication for turning". International Journal of Engineering Research and Applications (IJERA) ISSN: 2248–9622, Vol. 1, Issue 4, pp.1268–1273.