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Optimization of Cutting Parameters in CNC DRILLING of P30 tool Steel by using Taguchi Method

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Abstract - In recent years, by the progresses in manufacturing industry, great changes have especially been observed in machining of metals. All cutting parameters have already been investigated in order to advancing the properties of cutting tools and machine tools. These researches have improved material removals rate, decreased manufacturing time, improve surface roughness and resulted minimum cutting forces. The effects of dry and wet cuttings have widely been examined on metal machining. In this study, the effects of cutting fluid and dry cutting on surface roughness and cutting force have been examined in CNC turning of EN9 (AISI1055) medium carbon steel material and tungsten carbide P30 grade tool. This paper reviews the research work carried out from the inception to the development of CNC Turning within the past decade. It reports on the CNC Turning research relating to improving performance measures, monitoring and control of process, optimizing the process variables. The paper also discusses the future trend of research work in the same area.

Key Words: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)…

1.INTRODUCTION

onventional machining in which a sharp cutting tool is used to mechanical cut the material to achieve the desired shape, size and geometry. The predominant cutting action in machining involves shear deformation of the work material to form a various kinds of chips; as the chips removed, a new surface is exposed, that is called as machined surface. Machining is a most frequently applied to drilling machine

Drilling is a most common and complex used industrial machining processes of creating and originating a hole in mechanical components and work piece. The tool used, called a drill and the machine tool used is called a drill machine. Drilling can also be define as a rotary end-cutting tool having one or more cutting edges called lips, and having one or more helical or straight flutes for the passage of chips and passing the cutting fluid to the machining zone. The drilling operations performed on a drilling machine, which rotates and feed the drill to the work piece and creates the hole. Drilling usually performed with a rotating cylindrical tool that has two cutting edges on its working end (called a twist drill). Rotating drill fed into the stationary work piece to form a hole whose diameter is determined by the drill diameter. Drilling makes up about 25% of all the machining processes performed. Drilling is really a Complex Process, becauseOnly exit for the chips is the hole that filled by the drill. Friction results in heat in addition to that due to chip.

TYPES OF DRILLED HOLES

Through holes: Drill exits from the opposite side of the work piece called through hole. hole depth is equal to the work piece thickness or height.

Blind holes: Drill does not exit from the opposite side of the work piece called blind hole, hole Depth is less than work piece thickness or height.

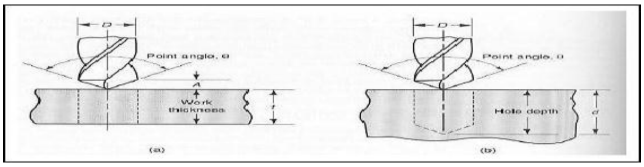

Figure 1 Types of drilled holes

DRILLING OPERATIONS

- Reaming
- Tapping
- Counter-boring
- Counter-sinking
- Centering or center-drilling
- Spot-facing

CLASSIFICATION OF DRILLING MACHINES

- Bench type drilling machine
- Upright drilling machine
- Radial drilling machine
- Gang type drilling machine

Multi spindle type drilling machine

Deep hole type drilling machine

Transfer type drilling machine

General purpose drilling machines of common use

Pillar drilling machine

CNC column drilling machine

METHODOLOGY

The Taguchi methodology is one of the optimizing techniques that based on the design of experiments (DOE) approach. The experiments analysis will propose to conduct using the design of experiments technique. Although full factorial designs can be use where in all the possible combinations can be test, we would use fractional factorial analysis methods for the experiment.

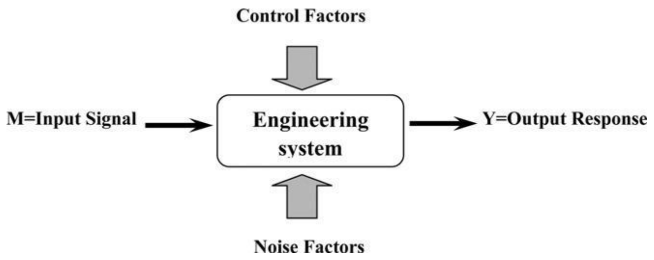

Figure 2 Methodology

The Taguchi Design is a design of experiment (DOE) approach developed by Dr. Genichi Taguchi in order to improve the quality of manufactured goods in Japan. Although similar to factorial design of experiment, the Taguchi design only conducts balanced (orthogonal) experimental combinations, which makes the Taguchi design even more efficient than a fractional factorial design. The Taguchi methodology has been proposed to overcome the limitations of full factorial analysis by simplifying and standardizing the fractional factorial design (Roy, 1990). Taguchi methodology involves identification of controllable and uncontrollable factors and the establishment of series of experiments to find out optimal combinations of the factors that has the greatest influence on the performance and least variation from the target of the design. The main advantage of Taguchi Design is its efficiency in that multiple factors can be consider at once and the optimal parameters can be identified with fewer experimental resources than the traditional (DOE) approach. In addition, Taguchi design allows looking into the variation caused by control factors and noise factors, while the variation caused by noise factors is usually ignore in the traditional DOE approach.

RESULTS AND DISCUSSION

The effect of various parameters such as cutting speed, work piece, feed, drill material, drill diameter and interaction between drill material and cutting speed were evaluated using ANOVA and factorial design analysis. A confidence interval of 95% has been used for the analysis. 18 trials were conducted in the experiment using L18 experimental design. One repetition for each of 18 trials was completed to measure Signal to Noise ratio (S/N ratio).

SURFACE ROUGHNESS (RA)

In this study surface roughness of 18 experimental trials with repetition has measured for each sample. For measuring surface roughness, the sampling length is taken as 3 mm and cut off length is taken as 0.8 mm. The results for surface roughness for each of the 18 experimental trials with repetition are given in Table 1.

Table.1 Result for Surface roughness

Trial	Tool	Speed	Feed	Drill	Work-	Surface		Mean	S/N Ratio
no	material	(RPM)	(mm/rev)	diameter	piece	roughness		Surface	
				(mm)		(µm)		roughness	
						I	II	(Ra)	
1	M2	80	0.1	4	EN 31	0.65	0.73	0.69	3.223018
2	M2	80	0.125	8	H 11	0.77	0.65	0.71	2.974833
3	M2	80	0.15	12	HCHCr	0.99	1.13	1.06	-0.50612
4	M2	160	0.1	4	H 11	0.98	0.6	0.79	2.047458
5	M2	160	0.125	8	HCHCr	0.89	0.99	0.94	0.537443
6	M2	160	0.15	12	EN 31	1.1	1.06	1.08	-0.66848
7	M2	244	0.1	8	EN 31	0.78	0.7	0.74	2.615366
8	M2	244	0.125	12	H 11	0.88	1.08	0.98	0.175478
9	M2	244	0.15	4	HCHCr	1.15	0.81	0.98	0.175478
10	M35	80	0.1	12	HCHCr	1.02	1.02	1.02	-0.172
11	M35	80	0.125	4	EN 31	0.56	0.82	0.69	3.223018
12	M35	80	0.15	8	H 11	0.79	0.61	0.7	3.098039
13	M35	160	0.1	8	HCHCr	0.89	0.83	0.86	1.310031
14	M35	160	0.125	12	EN 31	0.93	0.75	0.84	1.514414
15	M35	160	0.15	4	H 11	0.75	0.77	0.76	2.383728
16	M35	244	0.1	12	H 11	0.84	0.96	0.9	0.91515
17	M35	244	0.125	4	HCHCr	0.99	1.05	1.02	-0.172
18	M35	244	0.15	8	EN 31	0.86	0.88	0.87	1.209615

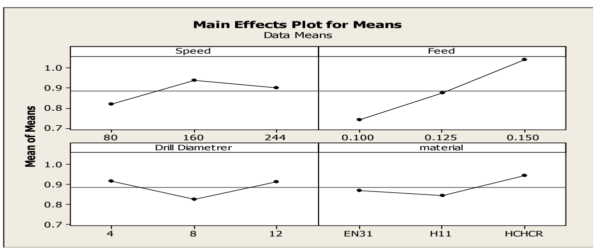

Figure 1.Main effect plot for Mean Surface roughness

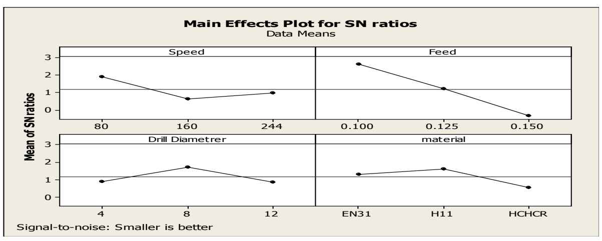

Figure 2.Main effect plot for SN ratios

CONCLUSIONS

The present study was carried out to study the effect of input parameters on the surface roughness. The following conclusions have been drawn from the study:

Surface roughness is mainly affected by work piece material, drill diameter and cutting speed.

REFARENCE

[1] Palanikumar K., Parkash S. and Shanmugan K., (2008), "Evaluation of delamination in drilling GFRP composites", Materials and Manufacturing process, Vol. 23(8), pp. 858-864.

[2] Taso C. C., (2008 , "Prediction of thrust force of step drill in drilling composite material by Taguchi method and radial basis function network", International Journal of Advanced,Manufacturing Technology, Vol. 36, pp. 11–18.

[3] Palanikumar K., (2010), "Modeling and Analysis of Delamination factor & surface roughness in drilling GFRP Composites", Materials and Manufacturing Processes, Vol. 25, pp. 1059-1067.