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ANALYSIS OF COOLANT ON MACHINING PROCESS PARAMETERS FOR RESPONSE

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The use of liquids eliminates environmental hazards associated with metal cutting and reduces manufacturing costs. Having little rudimentary knowledge of the Incoloy718 optimal machinability parameters and who until now was unaware of wear and surface roughness in the initial phase of reactions. The four factors are taken as input parameters with their three levels and are designed by Taguchi design of the experiment method to run the experiment. Factors of machining parameters are Cutting Speed, Feed, Depth of Cut and type of cooling during process of machining. Two reactions are optimized by the multipurpose technique and their parameters are predicted by the ANOVA method.

1. INTRODUCTION

Cutting and recycle fluids is quite expensive, it can cause skin and lung diseases to the machine operator and pollute the air. Due to these negative aspects of chlorine-based cutting fluids, the alternative method for cooling the work-device interface is a large area of interest for researchers [1]. Many advanced cooling techniques such as cryogenic cooling, minimum quantity lubrication (MQL), high pressure cooling (HPC) have been developed and applied.Applications include furnace components and equipment, petrochemical furnace cracker tubes, pigtails and headers, and sheathing for electrical heating. Metal cutting or simply machining is one of the oldest processes in the manufacturing industry to shape components.

In the leading edge of manufacturing, manufacturers are facing the challenges of high productivity, quality and overall economy in the field of manufacturing by machining. Traditional types and methods of cutting fluid have been found to be less effective with increased cutting velocity and feed when the cutting fluid cannot properly penetrate the chip-tool interface and smooth the interface due to bulk plastic contact and can smooth. Chip with tool rake surface[2].Machining rakes achieve crater wear on the surface and cause flank wear on the extraction surfaces due to continuous interactions and rubbing with chips and work surfaces. Surface roughness has been measured in two stages; One, after a few seconds of machining with the sharpening tool while recording the cutting temperature and forces and another, with monitoring the machining wear time at the time of the progress of machining.

Use and wear tools as per DOE's order and evaluate the surface of each run. Design experiments for machining with the factors given by MINITAB 14. To investigate the effect of cutting speed and to make a comparative evaluation of the performance of CVD coated[4] cement carbide tools on two critical reactions such as tool wear and surface integrity. To evaluate the variation of tool wear and surface roughness with machining progress by ANOVA analysis.

METHODOLOGY

Incoloy 718 is highly resistant to corrosion has high nickel content is sufficient to resist chloride ion stress corrosion cracking, and has a very stable austenite structure. Molybdenum and copper levels enable the alloy to resist reducing agents and acids. During the present research work, the effect of various parameters on performance different performance measurement in lathe machine was studied. The tool is used for cutting is CVD coated cemented carbide and machining parameters investigated include cutting speed, feed, depth of cut, and machining conditions [4]. Each of their three levels with this parameter is taken for the experiment as shown in Table 1.

Table 1 Parameters and level

Level	Cutting Speed Cs	Feed Fd	Depth of Cut Dc	Machining Condition M
1	400	0.1	0.2	Flood
2	600	0.2	0.4	MQL
3	800	0.3	0.6	DRY

L27 OA has been selected for DOE in MINITAB 14 to express the impact degree of machining condition components experiments with a combination of cutting speed, feed rate, depth of cut, and various cut parameters were designed by MINITAB 14. The coded design is shown in Table 2.

Table 2 Design of Experiment Run

S. No.	Cutting Speed Cs	Feed Fd	Depth of Cut Dc	Machining Condition M
1	1	1	1	1
2	1	1	1	2
3	1	1	1	3
4	1	2	2	1
5	1	2	2	2
6	1	2	2	3
7	1	3	3	1
8	1	3	3	2
9	1	3	3	3
10	2	2	3	1
11	2	2	3	2
12	2	2	3	3
13	2	3	1	1
14	2	3	1	2
15	2	3	1	3
16	2	1	2	1
17	2	1	2	2
18	2	1	2	3
19	3	3	2	1

20	3	3	2	2
21	3	3	2	3
22	3	1	3	1
23	3	1	3	2
24	3	1	3	3
25	3	2	1	1
26	3	2	1	2
27	3	2	1	3

RESULT AND DISCUSSION

Passing experiment as per the order of design shown in table 2 and recorded the response in terms of surface roughness and tool wear [6]. These responses are followed by TOPSIS statistically analysis which determines the coefficient of the pass has been calculated, the optimum for the maximum CCI input parameter. The maximal CCI value is 0.9823, with parameters cutting speed 1, feed 3, DOC 3, and machining state 2 level are optimize as shown in Fig. 1.

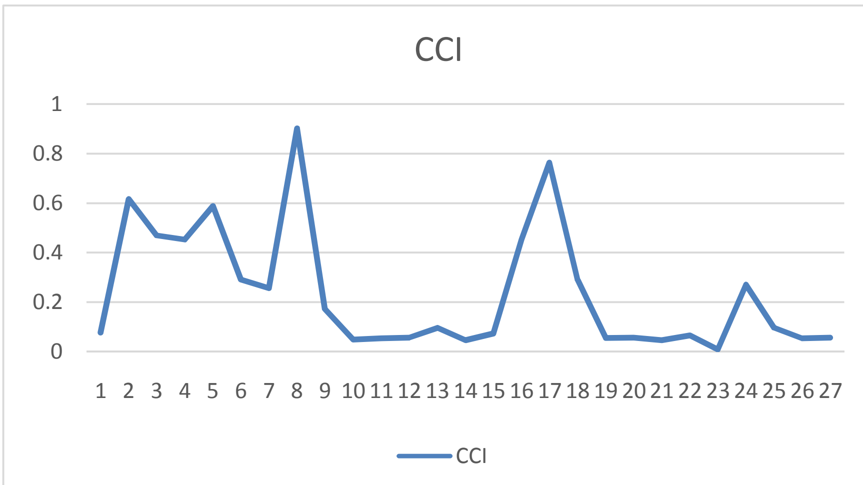

Fig. 1 Close Coefficient Index of response

The ANOVA table experimental Variance is shown in Table 3, it is also shown that the cutting speed is significant in the combination reactions according to the CCI value. According to the ANOVA analysis of the optimization technique [5] the p value for cutting speed is less than 0.05, so the key factor for CCI is the speed reduction during machining.

Table 3 Analysis of Variance for Means

Source	**DF**	**Seq SS**	**Adj SS**	**Adj MS**	**F**	**P**
Cs	2	0.86875	0.75875	0.37237	5.67	0.028
Fd	2	0.33381	0.22381	0.10491	1.72	0.243
Dc	2	0.22698	0.11698	0.05149	0.93	0.429
M	2	0.21587	0.10587	0.04594	0.85	0.458
Cs*M	4	0.37025	0.26025	0.05556	0.99	0.463
Fd*M	4	0.17642	0.06642	0.00711	0.27	0.866
Dc*M	4	0.15337	0.04337	0.00134	0.19	0.918
Residual Error	6	0.50609	0.39609	0.05568		
Total	26	2.15154				

The main effect plots for the SN ratio are used to determine whether the pattern is statistically significant. In the plots, the x-axis indicates the value of the cutting parameters and the y-axis indicates the CCI in terms of SN ratio. The main effect plots determine the optimal design conditions. Fig. 2 shows the main effect plots for tool wear on work-piece Incoloy 718 and CVD carbide coated tools. The high point in each factor is the optimal value. Main effect plot shows that optimal parameter for higher response is the cutting speed 1, feed 3, DOC 1 and the machining conditions is 2 level.

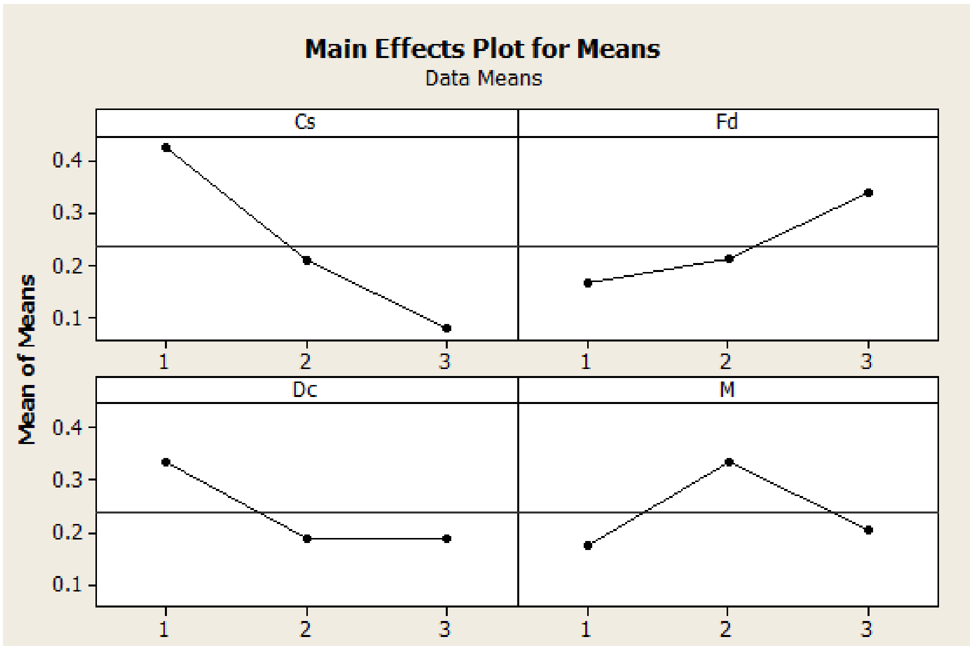

Fig 2 Main effect plot

CONCLUSION

The ANOVA analysis gives important factors for tool wear, machining conditions, cutting speed for surface roughness and predicted critical parameters for combining tool wear and surface roughness, cutting speed. Mean effect graph analysis is shown to be the optimal parameter for their respective responses. The optimization multi-objective technique for both reactions is used to find input parameters for optimal responses. The TOPSIS method can easily transform the multipurpose problem into a single objective and give optimal parameters for both reactions simultaneously.

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