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"MACHINE TOOL LIFE IMPROVE DURING HOT MACHINING PROCESS USING TAGUCHI METHOD"

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ABSTRACT

In this project attempts on optimizing the cutting condition and Tool Life obtained in hot machining of hard Material with Hot machining experiments were performed on lathe machine using carbide tool insert. Taguchi designs provide a powerful and efficient method for designing products that operate consistently and optimally over a variety of conditions. , the primary goal is to find factor settings that minimize response variation, while adjusting (or keeping) the process on target. Experiments were conducted based on Taguchi L9 orthogonal array. The statistical method of signal-to-noise (S/N) ratio and were employed to investigate the optimum process parameters like speed feed, depth of cut and work piece temperature and their effect on the performance characteristics i.e., tool life . The results of the study indicate that feed rate has the most significant effect on tool life. Cutting speed and feed rate has the most significant effect on material tool life.

Key Words: *Taguchi , Hot machining, Lathe machine, Tool life, Taguchi, carbide tool, signal-to-noise*

I. INTRODUCTION

1.1 Overview

Presentation High quality work materials have tremendous applications in the field of aeronautics, nuclear, biomedical, vehicle, etc It is an inciting task to machine these excellent materials. Notwithstanding the way that there have been various techniques progressed to machine such materials, such strategies are expensive and extravagant cutting devices are expected to machine those materials. Hot machining is where work piece must be warmed underneath recrystallization temperature anyway on occasion it has been moreover warmed above recrystallization temperature. High Manganese steel and other high wear resistance exacerbates which are commonly used for various applications are having high strain setting property. The hot machining movement relies upon the molding wonder about the locale of shear zone (misshapening zone). Unwinding of workpiece at the misshapening zone makes the material malleable (lessens shear quality) which assists with diminishing cutting power and addition in surface honesty. Warming gas fire utilized for activity ought to be in a steady way, which conveys same temperature all through the workpiece material. Warming should be possible earlier or on the other hand at the hour of machining. The blowpipe course should be opposite to gadget holder for better warming. There are many controlling components, for instance, workpiece temperature, cutting speed, feed rate, significance of cut, nose range, cutting time, etc which contribute on the exhibition attributes. The issue emerges might be because of the utilization of off base degrees of control

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boundaries, for example, feed, profundity of cut and cutting speed, and so on Apparatus life and force utilization have a lot of commitment in cost of assembling. Surface completion is the most wanted trademark for good execution of item. Chip decrease coefficient is additionally a successful measure which assesses the machinability. The suitable determination of machining boundaries must be made to accomplish the above machinability models.

The warmth necessities for this cycle ought to fulfill the accompanying conditions

1. Warmth input rate should be exceptionally high with the end goal that the work piece gets warmed up in a very short time.
2. The warmth produced should warm just the shear zone.
3. Consistent temperatures over a wide reach ought to be created.
4. The establishment cost and working expense ought to be less. In light of the above prerequisites Oxy Acetylene gas fire was utilized in the led analyses of Hot Machining

1.2 Hot machining

Hot machining is the cycle which is utilized for simple machining and to wipe out the issues of low cutting velocity, feeds and hefty burdens on the machine direction. These issues emerge when machining measure is being done on the new and extreme materials. The fundamental rule behind this cycle is the outside of the work piece which is to be machined is pre warmed to a temperature underneath the re-crystallization. By this warming, the shear power gets diminished and machining measure turns out to be simple. During the machining cycle, rather than expanding the nature of the shaper materials, mellowing of the work piece is one of a substitute. In hot machining, a section or entire of the work piece is warmed. Warming is performed previously or during machining. The determination of a warming technique for getting ideal warming of metals for machining is basic. Broken warming strategies could instigate undesirable basic changes in the work piece and increment the expense. In research, many warming techniques are used. The techniques generally utilized are electrical obstruction and plasma circular segment warming. A portion of the benefits of hot machining measure are,

1. Simple arrangement of chip
2. Reduced stuns to the devices
3. Great surface completion of the work piece On other hand the fundamental hindrance of this cycle is the work piece miniature structure may get upset because of warming.

To defeat the disservices during hot machining, some essential prerequisites must be taken. They are as per the following.

1.3 Basic Requirements of Work piece Heating Technique:

1. The utilization of outside warmth ought to be restricted at the shear zone, only in front of the forefront, where the twisting of the work piece material is most extreme
2. Warming ought to be bound to a little zone as could be expected under the circumstances, with the goal that the dimensional accuracy can be endured.
3. The strategy for heat gracefully ought to be joined with fine temperature control device as the apparatus life is temperature touchy.
4. Machined surfaces must not be sullied or over warmed, bringing about conceivable metallurgical change or mutilation to the whole material.

II. METHODOLOGY

Steps In Performing A Taguchi Experiment:

he way toward playing out a Taguchi explore follows various unmistakable advances. [6] They are

Step1: detailing of the issue – the achievement of any trial is subject to a full comprehension of the idea of the issue.

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Stage 2: distinguishing proof of the yield execution attributes generally pertinent to the issue.
Stage 3: recognizable proof of control factors, commotion factors and sign variables (assuming any). Control factors are those which can be controlled under typical creation conditions. Commotion factors are those which are either excessively troublesome or too costly to even consider controlling under ordinary creation conditions. Signal components are those which influence the mean presentation of the cycle.
Stage 4: determination of factor levels, potential connections and the levels of opportunity related with each factor and the cooperation impacts.
Stage 5: plan of a fitting symmetrical cluster (OA).
Stage 6: planning of the test.
Step 7: running of the experiment with appropriate data collection.
Step 8: statistical analysis and interpretation of experimental results.
Step 9: undertaking a confirmatory run of the experiment.

III. EXPERIMENTAL WORK

Table 3.1: Observations Experimental Table

TRAIL NUMBER (RUNS)	CONTROL FACTORS				RESPONSE Tool Wear (mm)	SNR
	CUTTING SPPED (1)	FEED (2)	DEPTH OF CUT (3)	TEMPERATURE (4)		
1	250	0.05	0.5	600	0.66	-3.61
2	250	0.1	1.0	400	0.79	-2.04
3	250	0.15	1.5	300	0.94	-0.54
4	350	0.05	1.0	300	0.88	-1.11
5	350	0.1	1.5	600	0.85	-1.41
6	350	0.15	0.5	400	0.84	-1.51
7	450	0.05	1.5	400	0.97	-0.26
8	450	0.1	0.5	600	0.92	-0.72
9	450	0.15	1.0	300	0.93	-0.63

Table 3.2: Average SNR Table

FACTOR'S SNR	CUTTING SPEED	FEED	DEPTH OF CUT	TEMPERATURE
SNR1	32.19	32.5	32.74	32.52
SNR2	31.07	30.62	31.09	31.34
SNR3	31.1	31.24	30.53	30.5
DELTA	1.12	1.88	2.21	2.02
RANK	4	3	1	2

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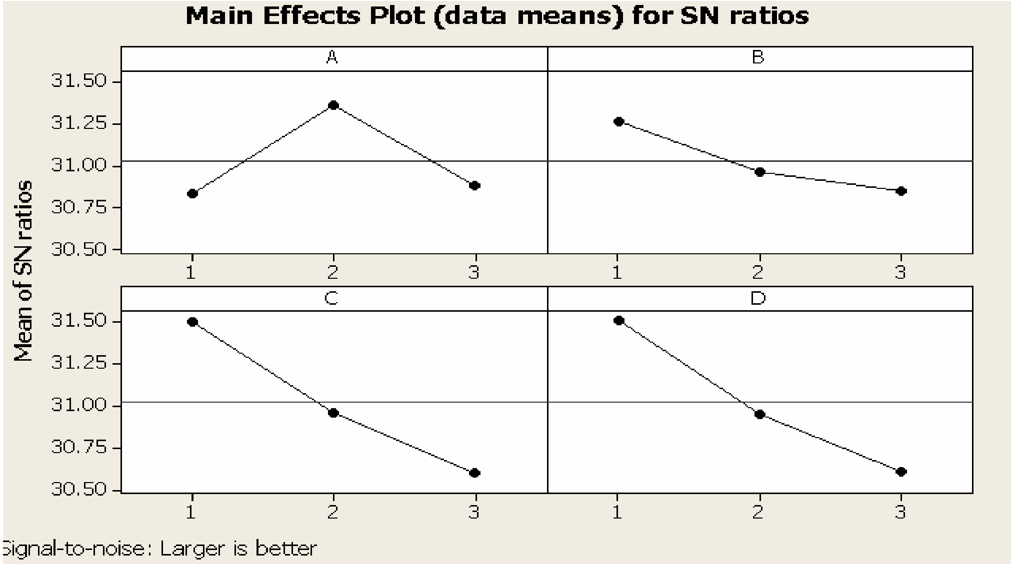

Figure 3.1 Main effect plot of control factors (Tool life)

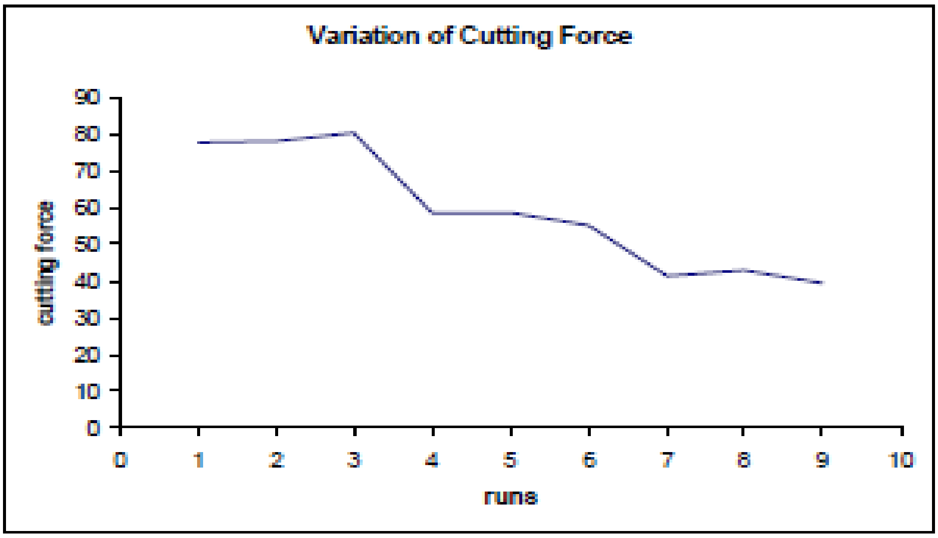

Figure 3.2 Variation of cutting force

IV. Result

In this project investigation was done with the point of improving the control components of turning activity in hot machining In request to consider the impact of factors and the potential connections between them in a base number of preliminaries, the Taguchi way to deal with trial configuration was embraced. Taguchi plans give a ground-breaking and effective technique for planning items that work reliably and ideally over an assortment of conditions. , the essential objective is to discover factor settings that limit reaction variety, while changing (or keeping) the cycle on track. A cycle planned with this objective will create more steady yield. An item planned with this objective will convey more predictable execution paying little mind to the climate in which it is utilized. From the past investigations it was discovered the force burned-through during turning tasks is principally because of shearing of the material and plastic disfigurement of the

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metal eliminated. Since both the shear quality and hardness benefits of designing materials decline with temperature, it was along these lines hypothesized that an expansion in work piece temperature would diminish the measure of intensity burned-through for machining and in the long run increment device life .For this test the ideal qualities are discovered to be Cutting Speed = 600, Feed = 1, Depth of Cut = 1.5, Temperature = 300

V. CONCLUSION

In this project observed by using ATP grade tool for turning operation by Hot Machining and Design of experiments using Taguchi statistical analysis. Find that tool life has increased and power has been decreased. For this experiment the optimum values are found to be Cutting Speed = 450, Feed = 1, Depth of Cut = 1.5, Temperature = 600.

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