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Comparison of Tool Material Performance on HYBRID Material for surface Roughness

Kuldeep Singh and Harish Kumar Garg
Department of Mechanical Engineering,
D.A.V University Jalandhar, (PB), INDIA

(Corresponding author: Kuldeep Singh)
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ABSTRACT: This paper presents a simple but effective method for performing the Surface Roughness of Hybrid Material. Hybrid Method is a combination of two or more substances or Materials. We have done eight experiments using TNMG2000 TOOL and Eight Experiment using K10 TOOL. The purpose of our study is to find out the Best experiment from both of the TOOL in terms of Minimum Surface Roughness. Simulation Result shows the Best calculated Result Using MATLAB simulator.

Keywords: Turning, TNMG2000, K10, MATLAB, Surface Roughness.

I. INTRODUCTION

Turning is an engineering machining process in which a cutting tool, typically a non-rotary tool bit, describes a helical tool path by moving more or less linearly while the work piece rotates. The tool's axes of movement may be literally a straight line, or they may be along some set of curves or angles, but they are essentially linear in the nonmathematical sense. Usually the term "turning" is reserved for the generation of external surfaces by this cutting action, whereas this same essential cutting action when applied to internal surfaces (that is, holes, of one kind or another) is called "boring". Thus the phrase "turning and boring" categorizes the larger family of (essentially similar) processes. The turning processes are typically carried out on a lathe, considered to be the oldest machine tools, such as straight turning, taper turning, profiling or external grooving. Those types of turning processes can produce various shapes of materials such as straight, conical, curved, or grooved work piece. In general, turning uses simple single-point cutting tools. Each group of work piece materials has an optimum set of tools angles which have been developed through the years.

Turning is the removal of metal from the outer diameter of a rotating cylindrical work piece. Turning is used to reduce the diameter of the work piece, usually to a specified dimension, and to produce a smooth finish on the metal. Often the work piece will be turned so that adjacent sections have different diameters. Turning is the machining operation that produces cylindrical parts.

Today's fast changing manufacturing environment requires the application of optimization techniques in metal cutting processes to effectively respond to severe competitiveness and to meet the increasing demand of customizable quality product (low cost, high quality, easily deliverable) in the market.

Fig. 1. CNC Lathe Machine.

Fig. 2. K10.

Fig. 3. TNMG2000.

Turning Parameters: In turning, the speed and motion of the cutting tool is specified through several parameters. These parameters are selected for each operation based upon the work piece material, tool material, tool size, and more. Turning parameters that can affect the processes are:

a) **Cutting speed** - The speed of the work piece surface relative to the edge of the cutting tool during a cut, measured in surface feet per minute (SFM).

b) **Spindle speed** - The rotational speed of the spindle and the work piece in revolutions per minute (RPM). The spindle speed is equal to the cutting speed divided by the circumference of the work piece where the cut is being made. In order to maintain a constant cutting speed, the spindle speed must vary based on the diameter of the cut. If the spindle speed is held constant, then the cutting speed will vary.

c**) Feed rate** - The speed of the cutting tool's movement relative to the work piece as the tool makes a cut. The feed rate is measured in mm per revolution.

d) **Depth of cut** - The depth of the tool along the radius of the work piece as it makes a cut, as in a turning or boring operation. A large depth of cut will require a low feed rate, or else it will result in a high load on the tool and reduce the tool life. Therefore, a feature is often machined in several steps as the tool moves over at the depth of cut.

Surface roughness

Surface roughness is critical to the function ability of machine components the surface roughness decreases with increasing nose radius. Large nose radius tools have produced better surface finish than small nose radius tools. In this study the better quality surface roughness tester is use for measuring how surface is rough after each experiment on the work piece material. The challenge of modern machining industries is mainly focused on the achievement of high quality, in terms of work piece dimensional accuracy, surface finish, high production rate, less wear on the cutting tools, economy of machining in terms of cost saving and increase the performance of the product with reduced environmental impact. Surface roughness plays an important role in many areas and is a factor of great importance in the evaluation of machining Accuracy

MATLAB

The name MATLAB stands for Matrix Laboratory. MATLAB was written originally to provide easy access to matrix software developed by the LINPACK (linear system package) and EISPACK (Eigen system package) projects. MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming environment. Furthermore, MATLAB is a modern programming language environment: it has sophisticated data structures, contains built-in editing and debugging tools, and supports object-oriented programming. These factors make MATLAB an excellent tool for teaching and research. MATLAB has many advantages compared to conventional computer languages (e.g., C, FORTRAN) for solving technical problems.

II. EXPERIMENTAL SET - UP FOR STIR CASTING

Stir casting is a method which is used for the fabrication of the composites, in which the reinforcement particles are put in the molten matrix and a stirrer is used for the uniform distribution of the reinforcement particles in the molten matrix. The equipment consists of

Vertical muffle furnace

Muffle furnace is a box type oven which is a thermally insulated chamber which is used for heating and baking of any substance. Muffle furnaces are mainly of two types:

1. Horizontal muffle furnaces or front loaded muffle furnaces.
2. Vertical muffle furnaces or top loaded muffle furnaces.

CRUCIBLE

A crucible is a container that can withstand high temperatures and is used for melting and coal mining a substance that requires a high degree of heat. Crucibles are mostly made from clay or they made from such type of material that can withstand temperatures.

STIRRER

A stirrer is a mechanical device which is used for stirring the molten metal in the muffle furnace so that reinforcements can mix properly and the mixture becomes a homogeneous mixture.

MOULD. Mould is a hollow container which is used to give the desired shape to the molten metal.

III. MATERIALS COMPOSITION

Aluminum alloy, Al6061 was used as the base material. The silicon carbide particles of 200 mesh sizes with an average particle size of 75µm and graphite particles of 200 mesh sizes with an average particle size of 75 µm were used as the reinforcement materials. TNMG2000 and K10 carbide tool bits are used for turning tool.

The hybrid composites was made with composition as follows.

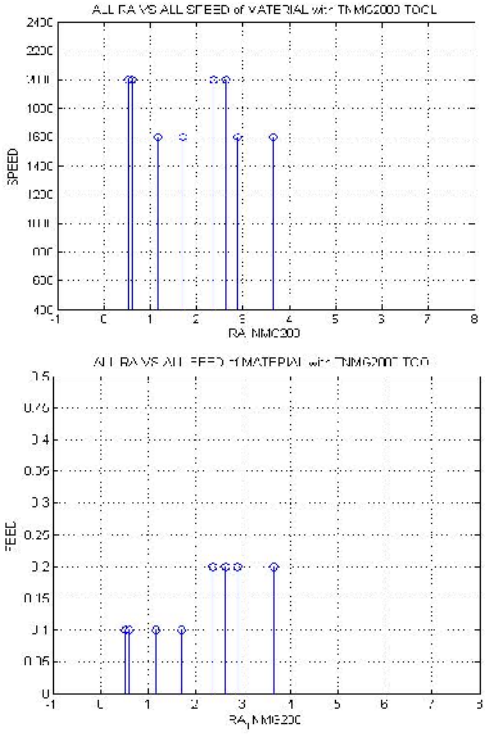
1. The hybrid aluminum matrix composite, the %age of reinforcements in the aluminum matrix composite were 10% silicon carbide particles by weight and 3% graphite particles by weight.

From the above Experiment with TNMG2000 and using MATLAB simulator we founded that Experiment no.2 is the best in terms of Minimum surface Roughness with SPEED 2000, FEED =0.1 and D.O.C=0.15. The graph for that shown in Fig. 4.

TNMG2000: These are the following experiments done with TNMG2000 TOOL:

EXPERIMENTS WITH TNMG 2000

S.NO	SPEED	FEED	D.O.C	RA
1	1600	0.2	0.35	2.893
2	2000	0.1	0.15	0.533
3	1600	0.2	0.15	3.657
4	2000	0.2	0.15	2.376
5	1600	0.1	0.15	1.709
6	2000	0.1	0.35	0.610
7	2000	0.2	0.35	2.635
8	1600	0.1	0.35	1.172



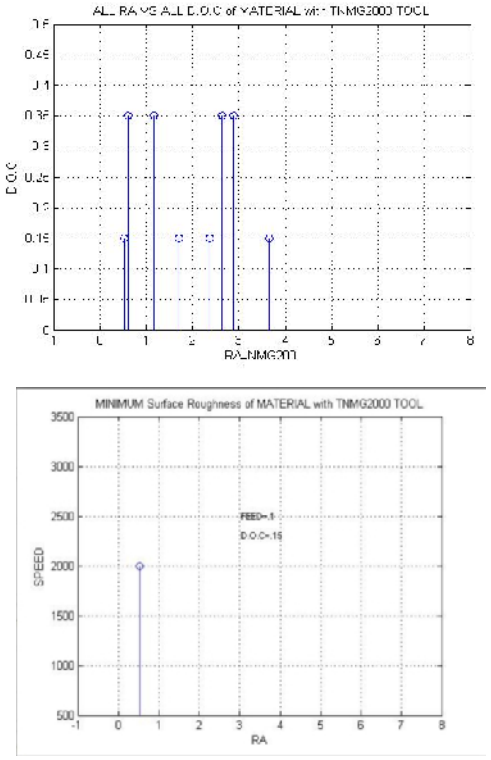


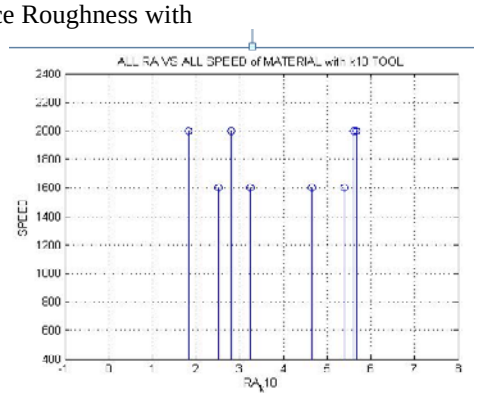
Fig. 4.

K10. These are the following experiments done with TNMG2000 TOOL.

EXPERIMENTS WITH K10

S.NO	SPEED	FEED	D.O.C	RA
1	1600	0.2	0.35	4.654
2	2000	0.1	0.15	2.813
3	1600	0.2	0.15	5.402
4	2000	0.2	0.15	5.670
5	1600	0.1	0.15	3.241
6	2000	0.1	0.35	1.828
7	2000	0.2	0.35	5.610
8	1600	0.1	0.35	2.506

From the above Experiment with K10 TOOL and using MATLAB simulator we founded that Experiment no.6 is the best in terms of Minimum surface Roughness with SPEED 2000, FEED =0.1 and D.O.C=0.35. The graph for that shown below:



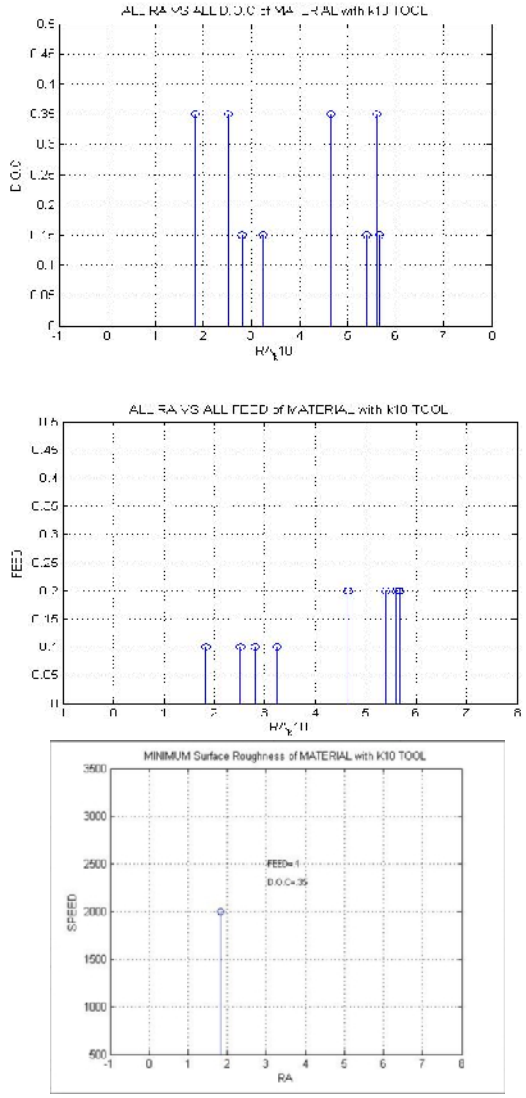


Fig.5.

IV. CONCLUSION

From the above Experimental study of Hybrid Material we found that experiment No.2 with FEED =0.1 and DOC=0.15 with TNMG2000 Tool and Experiment no.6 With FEED =0.1 and D.O.C=0.35 With K10 Tool is the best in terms of Minimum Surface Roughness. More study and Experiment on this is still doing for Better Performance like MRR (Material Removing Ratio) and many more. In future new things are come out with this Technique.

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