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Optimization of Machining Parameters of CNC Lathe in Turning using RSM

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***Abstract*: Metal matrix composites (MMCs) constitute an important class of design and weight-efficient structural materials that are encouraging every field of engineering application. There has been an increasing interest in composites containing low density and low-cost reinforcements. Among various discontinuously dispersed solids used, Alumina is one of the most inexpensive and low-density reinforcement available in large quantities as solid waste by-product during combustion of coal in thermal power plants. Hence, composites with Alumina as reinforcement are likely to overcome the cost barrier for wide spread applications in automotive and small engine applications.**

***Keywords*: Al2 O3 alluminum oxide, CTQ (Critical-To-Quality, MMC Metal matrix composites, Parts Per Million – PPM**

1. Introduction

Matrix material strongly impact composite's overall transverse modulus, shear properties, and compression properties. Matrix material also significantly limits a composite's maximum permissible operating temperature. Most of the matrix materials are relatively lighter, more compliant, and weaker vis-à-vis fibers and whiskers. However, the combination of fibers/whiskers and matrix can be so stiff, very strong, and also very light. Thus most of modern composites have very high specific strengths, i.e. very high strength/density ratios. This makes them most useful in aerospace applications, where weight minimization is a key design consideration. Fibers and whiskers in composites are held together by a binder known as matrix. This is required since fibers by themselves given their small cross-sectional area, cannot be directly loaded. Further they cannot transmit load among themselves. This limitation is addressed by embedding fibers in a matrix material. Matrix material serves various functions, the important ones being hold fibers together. share loads and stresses within the composite structure and support the overall structure and protects the composite from incursion of external agents such as humidity, chemicals, etc. and protects fibers from damage due to handling.

While selecting matrix material for a composite system, several considerations have to be factored into, principal ones being is Physical properties such a specific gravity. Mechanical properties such as modulus, strength, CTE, conductivity, etc. Melting of curing temperature for the matrix material. It strongly affects processing attributes of the composite and also uniform flow of matrix material into the composite system. Reactivity with fibers: One would certainly not desire possibility of chemical reactions between fibers and matrix material. Fabrication process compatible with matrix and fibers Reactivity with ambient environment and cost.

2. Research gab and objective

Objective of the present work is given below.

1. Fabrication of AA6064/Al_2O_3 metal matrix composites with different percentage of reinforcement by stir carting method.
2. Microstructure observation of all fabricated samples to observe distribution of reinforcement.
3. Investigation of mechanical properties of all samples.
4. Effects of turning parameters on dimensional deviation of metal matrix composites.

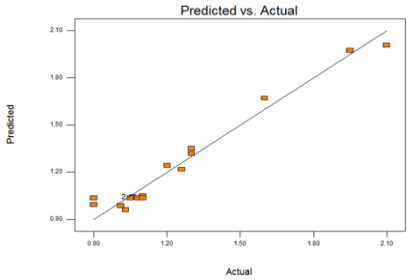

Fig. 1. Predicted vs. Actual

Table 1
Properties of aluminum alloy (6064)

Aluminum Alloy	Copper	Magnesium	Silicon	Iron	Manganese	Others
6064	0.1%	0.4-1.2%	0.6-1.3%	0.6%	0.4-1.0%	0.3%

Table 2
Mechanical properties of (Al_2O_3)

Alumina (Al_2O_3)	Grade	pH value	Mesh size	Min.
Neutral(1344-28-1)	Brockman 1 or 2	6.5-7.5	100-300	90%

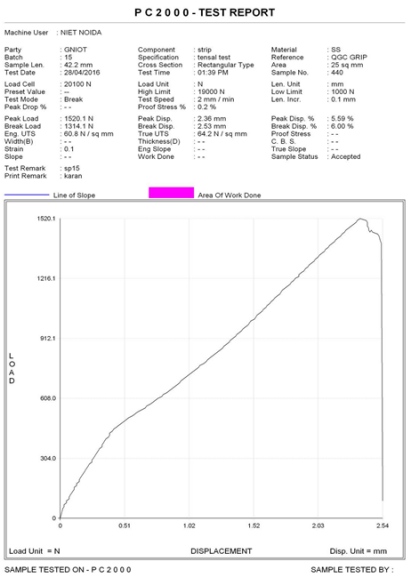

Fig. 2. Displacement vs. Load

3. Conclusion

In the present investigation, it was observed that maximum mechanical properties were obtained for AA6064/7.5% Al2O3. The optimum process parameters were found to be cutting speed 90.00, feed rate of 0.15 and depth of cut of 0.18 to achieve minimum dimensional deviation 1.12323 with the desirability equals to 0.950.

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