

SURFACE INTEGRITY EVALUATION ON ALUMINIUM-EPOXY COMPOSITE IN MACHINING USING TAGUCHI METHOD

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INTRODUCTION

Aluminium Epoxy Composite has now been used in machining processes for fabricating rapid prototyping (RP) due to cheaper as compared solid metal RP.

RESEARCH GAP

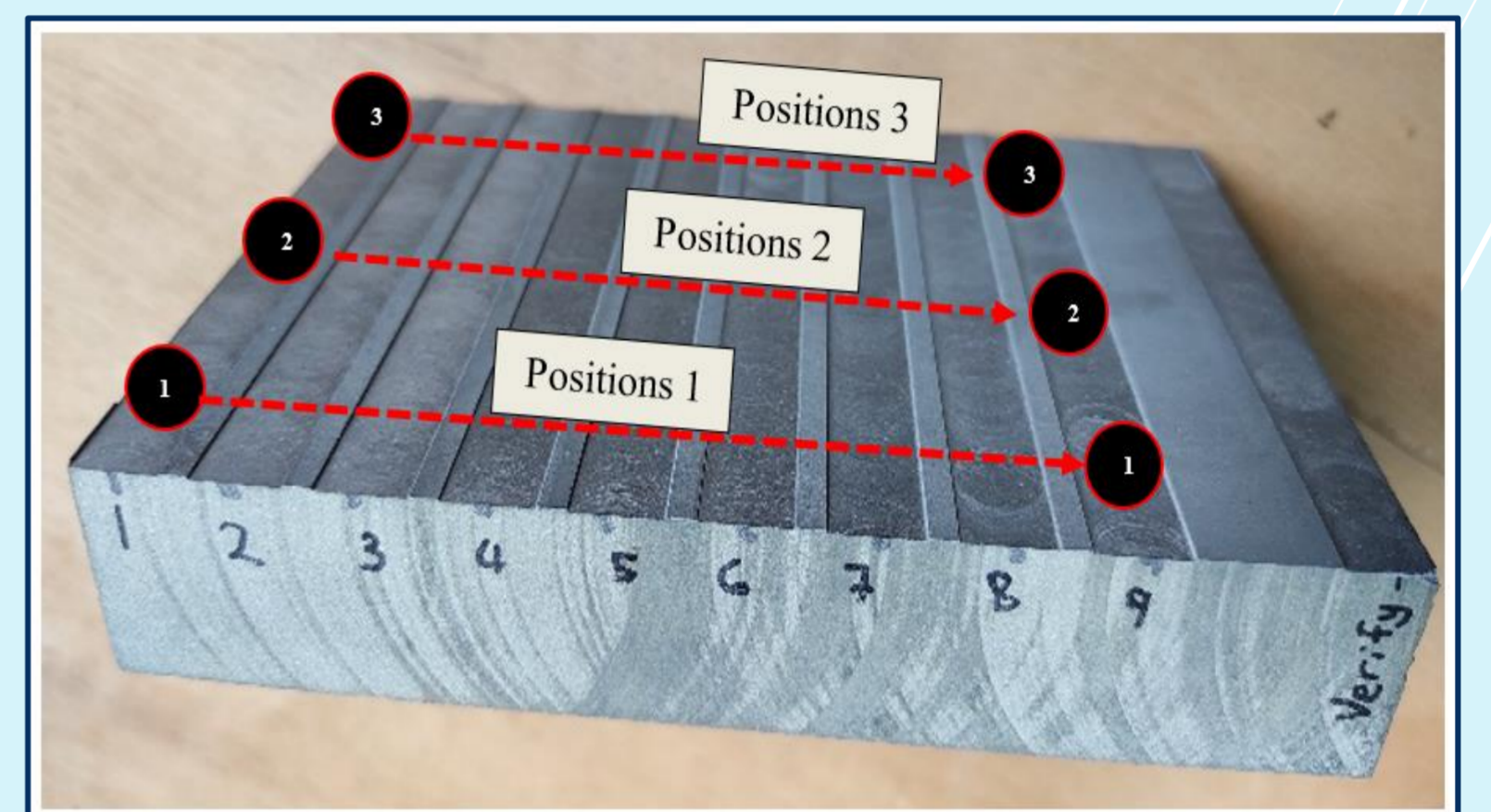
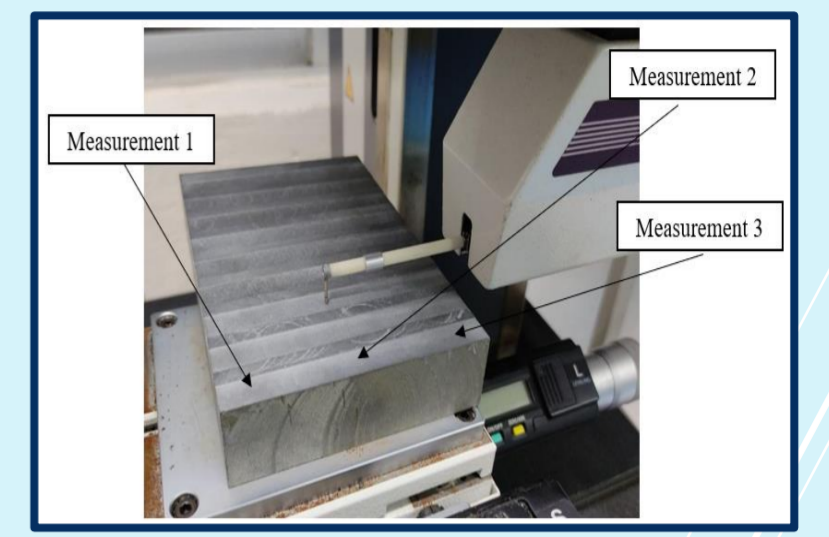
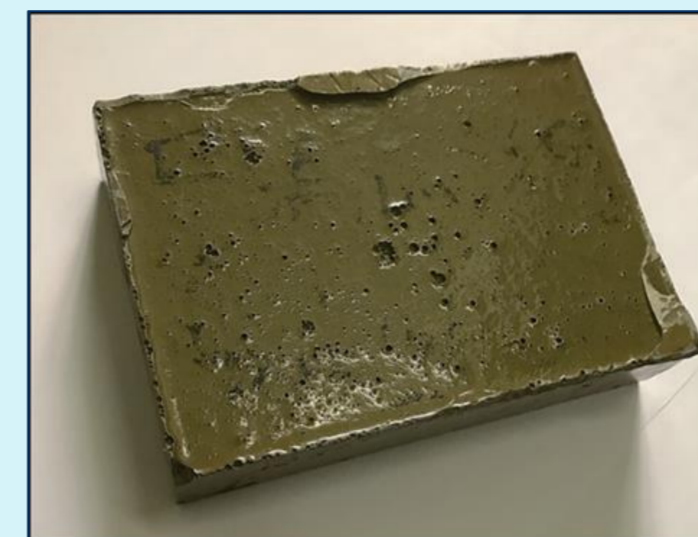
The use of this material has opened to numerous questions in terms of its machinability and life time as compared to metal. However the optimize parameter has not been found yet in getting the finest surface roughness and better cutting tool life.

METHODOLOGY

Taguchi (L9) method with ANOVA. was used as spindle speed, feed rate, and depth of cut were set as input factors using an L9 Orthogonal Array. From our analysis, we have identified that the optimum combination of cutting parameters for the finest surface roughness (response) are (2000, 3000 and 4000) rpm, feed cutting speeds ofate (300, 400 and 500) mm /min, and cutting depth (0.15, 0.20, and 0.25) mm.

A 30-wt% Aluminum filled epoxy and hardener was prepared with a dimension of 138 mm x 93.7 mm x 25.8 mm at room temperature. In preparing the samples, a plastic container acting as the mould of the same size was prepared for mixing process. The mixture of aluminium, epoxy and hardener was stirred for 15 minutes until the aluminium filler is uniformly distributed. The mixture was then de-gassed in a vacuum chamber for 60 minutes to remove any entrapped air from the samples.

Experiment No	Cutting Speed (rpm)	Feed Rate (mm/min)	DOC (mm)	Ra (µm)
1	1500	300	0.15	0.619
2	1500	400	0.20	0.640
3	1500	500	0.25	0.818
4	2000	300	0.20	0.726
5	2000	400	0.25	0.735
6	2000	500	0.15	0.858
7	2500	300	0.25	0.923
8	2500	400	0.15	0.823
9	2500	500	0.20	0.745



Aluminium epoxy samples fabricated

RESULTS

RECOMMENDED MACHINING

Parameters			Ra
Factor	Level	Values	
Cutting Speed (RPM)	1	2000	0.609µm
Feed Rate (mm/min)	1	300	
DOC (mm)	3	0.25	

Cutting speed is the most significant factor influencing aluminum epoxy surface roughness

COLLABORATION PROJECT WITH INDUSTRIES

1. Collaboration with injection moulding industry; **(i-ZEST Sdn Bhd)**. The company is researching for the optimized parameters in machining aluminium epoxy composite for rapid prototyping.



ADVANTAGES

1. **New Parameters** recommended in milling of aluminum epoxy composite.
2. **Longer** Cutting Tool Life
3. **Best** Surface Quality
4. **Less Cost** (due to optimum cutting condition)

