

Contents

1	Fundamental Consideration	1
1.1	Introduction	1
1.2	Surface Metrology	3
1.3	Fractal Characterization	6
1.3.1	Fractal Geometry	6
1.3.2	Fractal Dimension	6
1.3.3	Self-Similarity	7
1.3.4	Self-Affinity	8
1.3.5	Fractal Description of Roughness	9
1.3.6	Fractal Dimension Calculation	11
1.3.7	Fractal Dimension Measurement in the Present Study	12
1.4	Review of Roughness Study in Machining	12
1.5	Design of Experiments	18
1.5.1	Full Factorial Design	19
1.5.2	Central Composite Design	19
1.6	Response Surface Methodology	21
1.7	Closure	22
	References	22
2	Fractal Analysis in CNC End Milling	29
2.1	Introduction	29
2.2	Experimental Details	30
2.2.1	Design of Experiments	30
2.2.2	Machine Used	30
2.2.3	Cutting Tool Used	31
2.2.4	Work-Piece Materials	31
2.3	Results and Discussion	32
2.3.1	RSM for Mild Steel	32
2.3.2	RSM for Brass	38
2.3.3	RSM for Aluminium	40
2.4	Closure	42

3	Fractal Analysis in CNC Turning	45
3.1	Introduction	45
3.2	Experimental Details	47
3.2.1	Design of Experiments	47
3.2.2	Machine Used	47
3.2.3	Cutting Tool Used	47
3.2.4	Work-Piece Materials	47
3.3	Results and Discussion	48
3.3.1	RSM for Mild Steel	49
3.3.2	RSM for Brass	50
3.3.3	RSM for Aluminium	54
3.4	Closure	56
4	Fractal Analysis in Cylindrical Grinding	57
4.1	Introduction	57
4.2	Experimental Details	58
4.2.1	Design of Experiments	58
4.2.2	Machine Used	58
4.2.3	Work-Piece Materials	58
4.3	Results and Discussion	59
4.3.1	RSM for Mild Steel	59
4.3.2	RSM for Brass	62
4.3.3	RSM for Aluminium	66
4.4	Closure	68
5	Fractal Analysis in EDM	69
5.1	Introduction	69
5.2	Experimental Details	71
5.2.1	Design of Experiments	71
5.2.2	Machine Used	72
5.2.3	Work-Piece Materials	72
5.2.4	Tool Electrode Used	72
5.3	Results and Discussion	73
5.3.1	RSM for Mild Steel	74
5.3.2	RSM for Brass	76
5.3.3	RSM for Tungsten Carbide	77
5.4	Closure	81
	References	81



<http://www.springer.com/978-3-642-17921-1>

Fractal Analysis in Machining

Sahoo, P.; Barman, T.; Davim, J.P.

2011, VII, 121 p. 53 illus., Softcover

ISBN: 978-3-642-17921-1