

Contents

Introduction to Machining Processes	1	Nontraditional Machining Processes	507
Fundamentals of the Machining Process	5	Introduction	509
Mechanics of Chip Formation	7	Abrasive Jet Machining	511
Forces, Power, and Stresses in Machining	13	Abrasive Flow Machining	514
Surface Finish and Surface Integrity	19	Waterjet/Abrasive Waterjet Machining	520
Tool Wear and Tool Life	37	Ultrasonic Machining	528
Cutting Tool Materials	49	Electrochemical Machining	533
High-Speed Tool Steels	51	Electrochemical Grinding	542
P/M High-Speed Tool Steels	60	Electrochemical Discharge Grinding	548
Cast Cobalt Alloys	69	Electrostream and Capillary Drilling	551
Cemented Carbides	71	Shaped Tube Electrolytic Machining	554
Cermets	90	Electrical Discharge Machining	557
Ceramics	98	Electrical Discharge Grinding	565
Ultradhard Tool Materials	105	Electron Beam Machining	568
Cutting Fluids	119	Laser Beam Machining	572
Metal Cutting and Grinding Fluids	121	Appendix: Laser-Enhanced Etching	576
Traditional Machining Processes	133	Thermal Energy Method	577
Turning	135	Chemical Milling	579
Boring	160	Photochemical Machining	587
Trepanning	175	High-Productivity Machining	595
Planing	181	High-Speed Machining	597
Shaping and Slotting	187	High Removal Rate Machining	607
Broaching	194	Machine Controls and Computer Applications in Machining	611
Drilling	212	Numerical Control	613
Reaming	239	Adaptive Control	618
Countersinking, Counterboring, and Spotfacing	249	CAD/CAM Applications in Machining	627
Roller Burnishing	252	Machining of Specific Metals and Alloys	637
Tapping	255	Machinability Test Methods	639
Appendix: Cold Form Tapping	265	Machining of Cast Irons	648
Thread Milling	268	Machining of Carbon and Alloy Steels	666
Thread Grinding	270	Appendix: Machinability Testing of Carbon and Alloy	
Thread Rolling	280	Steels	677
Die Threading	296	Machining of Stainless Steels	681
Milling	303	Machining of Tool Steels	708
Gear Manufacture	330	Machining of P/M Tool Steels	733
Sawing	356	Machining of Heat-Resistant Alloys	736
Multiple-Operation Machining	366	Machining of Aluminum and Aluminum Alloys	761
Automatic Lathes	367	Machining of Copper and Copper Alloys	805
Machining Centers	393	Machining of Magnesium and Magnesium Alloys	820
Transfer Machines	395	Machining of Zinc Alloy Die Castings	831
Flexible Manufacturing Systems	397	Machining of Nickel and Nickel Alloys	835
Proper Fixturing	404	Machining of Reactive Metals	844
Tool Condition Monitoring Systems	411	Machining of Refractory Metals	858
Grinding, Honing, and Lapping	419	Machining of Beryllium	870
Principles of Grinding	421	Machining of Uranium and Uranium Alloys	874
Appendix: Comparison of Cutting and Grinding	426	Machining of Powder Metallurgy Materials	879
Grinding Equipment and Processes	430	Machining of Metal-Matrix Composites and Honeycomb	
Superabrasives	453	Structures	893
Honing	472	Metric Conversion Guide	903
Lapping	492	Abbreviations and Symbols	906
		Index	909