

Contents

| | | |
|----------|--|-----------|
| 1 | Surface Quality and Finishing Technology | 1 |
| 1.1 | Introduction | 1 |
| 1.2 | Surface Quality of Part | 2 |
| 1.2.1 | Product Quality | 2 |
| 1.2.2 | Part Quality | 3 |
| 1.2.3 | Surface Quality of Part | 3 |
| 1.3 | Surface Finishing Technology | 13 |
| 1.3.1 | Connotation | 13 |
| 1.3.2 | Function and Characteristics | 14 |
| 1.3.3 | Classification | 15 |
| 1.3.4 | Finishing Effects | 20 |
| 1.4 | Evaluation of Surface Quality and Selection of Finishing Methods | 26 |
| 1.4.1 | Surface Quality Evaluation | 26 |
| 1.4.2 | Measurement of Evaluation Indexes | 47 |
| 1.4.3 | The Choice of Finishing Methods | 53 |
| 1.5 | Current Situation and Trend of Finishing Technologies | 59 |
| 1.5.1 | Brief History and Present Situation | 59 |
| 1.5.2 | Development Trends | 61 |
| | References | 63 |
| 2 | Barrel Finishing Technology | 65 |
| 2.1 | Introduction | 65 |
| 2.1.1 | Connotation | 65 |
| 2.1.2 | Classification | 69 |
| 2.1.3 | Functional Characteristics and Application Scope | 69 |
| 2.2 | Rotary Barrel Finishing | 72 |
| 2.2.1 | Finishing Principle and Characteristics | 72 |
| 2.2.2 | Main Factors Affecting Finishing Effects | 73 |
| 2.2.3 | Equipment Types and Design | 74 |

| | | |
|----------|---|------------|
| 2.3 | Vibratory Barrel Finishing | 75 |
| 2.3.1 | Finishing Principle and Characteristics | 75 |
| 2.3.2 | Main Factors Affecting Finishing Effects | 79 |
| 2.3.3 | Equipment Types and Design | 81 |
| 2.4 | Whirling Barrel Finishing | 88 |
| 2.4.1 | Finishing Principle and Characteristics | 88 |
| 2.4.2 | Main Factors Affecting Finishing Effects | 89 |
| 2.4.3 | Equipment Types and Design | 91 |
| 2.5 | Centrifugal Barrel Finishing | 94 |
| 2.5.1 | Finishing Principle and Characteristics | 94 |
| 2.5.2 | Main Factors Affecting Finishing Effects | 108 |
| 2.5.3 | Equipment Types and Design | 116 |
| 2.6 | Vertical Spindle Barrel Finishing | 120 |
| 2.6.1 | Finishing Principle and Characteristics | 120 |
| 2.6.2 | Main Factors Affecting Finishing Effects | 131 |
| 2.6.3 | Equipment Types and Design | 139 |
| 2.7 | Horizontal Spindle Barrel Finishing | 144 |
| 2.7.1 | Finishing Principle and Characteristics | 144 |
| 2.7.2 | Main Factors Affecting Finishing Effects | 154 |
| 2.7.3 | Equipment Types and Its Design | 164 |
| 2.8 | Finishing Medium | 168 |
| 2.8.1 | Abrasive Blocks | 170 |
| 2.8.2 | Liquid Medium | 186 |
| 2.9 | Mass Finishing Applications | 189 |
| 2.9.1 | Introduction | 189 |
| 2.9.2 | Applications | 193 |
| | References | 222 |
| 3 | Magnetic Abrasive Finishing Technology | 225 |
| 3.1 | Introduction | 225 |
| 3.1.1 | Basic Meaning | 226 |
| 3.1.2 | Force Analysis | 227 |
| 3.1.3 | Trajectory of Magnetic Abrasive | 230 |
| 3.1.4 | Finishing Mechanism | 232 |
| 3.1.5 | Expiration Analysis of Magnetic Abrasive | 235 |
| 3.2 | Magnetic Abrasive | 237 |
| 3.2.1 | Composition | 237 |
| 3.2.2 | Classification and Model | 239 |
| 3.2.3 | Preparation | 241 |
| 3.2.4 | Main Performance Parameters | 256 |
| 3.3 | Magnetic Abrasive Finishing Device | 272 |
| 3.3.1 | Composition of Magnetic Abrasive Finishing Device | 272 |
| 3.3.2 | Design of the Magnetic Field Generator | 276 |
| 3.3.3 | Design of Magnetic Pole Head | 287 |

- 3.4 Factors Affecting Finishing Effects 297
 - 3.4.1 Motion Parameters 298
 - 3.4.2 Process Parameters 301
 - 3.4.3 Equipment Parameters 306
 - 3.4.4 Other Parameters 311
- 3.5 Application Example of Magnetic Abrasive Finishing 314
 - 3.5.1 Introduction 314
 - 3.5.2 Finishing Effect 315
 - 3.5.3 Application Examples 317
- References 332
- 4 Fluid Magnetic Abrasive Finishing Technology 337**
 - 4.1 Introduction 337
 - 4.1.1 Presentation of the Fluid Magnetic Abrasive Surface Finishing Technology 337
 - 4.1.2 Characteristics of the Fluid Magnetic Abrasive Surface Finishing Technology 339
 - 4.2 Fluid Magnetic Abrasive Finishing Mechanism 341
 - 4.2.1 Fluid Magnetic Abrasive Rheological Properties Mechanism 341
 - 4.2.2 Fluid Magnetic Abrasives Finishing Mechanism 344
 - 4.3 Fluid Magnetic Abrasive 348
 - 4.3.1 Composition 348
 - 4.3.2 Preparation Technology 354
 - 4.3.3 Performance Parameters 356
 - 4.4 Fluid Magnetic Abrasive Finishing Device 373
 - 4.4.1 Basic Requirements of Finishing Device 373
 - 4.4.2 Magnetic Field Design and Finite Element Analysis 374
 - 4.4.3 Device Design 381
 - 4.5 Main Factors and Finishing Effects Affecting Fluid Magnetic Abrasive Performance 384
 - 4.5.1 Finishing Process 384
 - 4.5.2 Main Affecting Factors 385
 - 4.5.3 Finishing Effects 390
 - 4.6 The Surface Modification of Fluid Magnetic Abrasive 393
 - 4.6.1 Existent Insufficiencies of Fluid Magnetic Abrasive 393
 - 4.6.2 The Surface Modification of Fluid Magnetic Abrasive 393
 - References 397
- 5 Two-Phase Swirling Flow Hole Finishing 401**
 - 5.1 Introduction 401
 - 5.1.1 Presentation of Two-Phase Swirling Flow Hole Finishing 401

| | | |
|-------|---|-----|
| 5.1.2 | Characteristics of the Two-Phase Swirling Flow Hole Finishing | 402 |
| 5.2 | Theory and Numerical Simulation of Swirling Flow | 403 |
| 5.2.1 | Single-Phase Swirling Flow | 403 |
| 5.2.2 | Two-Phase Swirling Flow | 419 |
| 5.2.3 | Simulation of Gas-Particle Two-Phase Swirling Flow | 431 |
| 5.3 | Finishing Mechanism of Gas-Particle Swirling Flow | 435 |
| 5.3.1 | Formation of Flow Field | 436 |
| 5.3.2 | Force Analysis | 438 |
| 5.3.3 | Microscopic Motion Feature | 445 |
| 5.3.4 | Finishing Mechanism | 446 |
| 5.4 | Experimental Device of Gas Particle Two-Phase Swirling Flow Finishing | 449 |
| 5.4.1 | Overall Design | 449 |
| 5.4.2 | Formation Components of the Swirling Flow | 450 |
| 5.4.3 | Other Parts | 463 |
| 5.5 | Main Factors and Finishing Effects | 467 |
| 5.5.1 | Technical Process | 467 |
| 5.5.2 | Main Factors | 469 |
| 5.5.3 | Finishing Performance | 480 |
| 5.6 | Two-Phase Compulsive Circulation Flow Finishing | 482 |
| 5.6.1 | Gas-Particle Two-Phase Compulsive Circulation Flow Finishing | 482 |
| 5.6.2 | Liquid-Particle Two-Phase Compulsive Circulation Flow Finishing | 486 |
| | References | 495 |



<http://www.springer.com/978-3-662-54131-9>

Surface Finishing Theory and New Technology

Yang, S.; Li, W.

2018, X, 497 p. 443 illus., Hardcover

ISBN: 978-3-662-54131-9