

Table of Contents

Introduction	13
PART I . Fundamentals of the burnishing process	19
1. General information	21
1.1. Development of burnishing	21
1.2. Purpose and range of application	23
1.3. Application limitations	25
1.4. Advantages and disadvantages of burnishing	27
1.5. Economic efficiency	29
2. Kinematic characteristics of burnishing methods	32
2.1. Classification of burnishing tools and methods	32
2.2. Static methods	36
2.2.1. Turning thrust burnishing	36
2.2.2. Slide thrust burnishing	68
2.3. Dynamic methods	73
2.3.1. Concentrated impact burnishing	74
2.3.2. Dispersed impact burnishing	83
3. Physical bases of burnishing process	87
3.1. Physical model of rolling burnishing	87
3.2. Strengthening the surface layer	92
3.3. Depth of run of plastic deformations	103
3.4. Metallographic structure	112
3.5. Temperature in burnishing zone	118
3.6. Condition of residual stress	122
3.7. The composition of surface layer after burnishing	136
4. Performance effects of burnishing	140
4.1. Fatigue strength	140
4.2. Grindability	150
4.2.1. Abrasive wear	150
4.2.2. Friction coefficient	162
4.2.3. Resistance to galling	163
4.3. Corrosiveness	166
4.4. Contact stiffness	170
4.5. Other effects of burnishing	172
5. Loads and deformations of roughness in burnishing process	173
5.1. Loads conditions in a working system	173
5.2. Deformations of roughness	178
6. The influence of burnishing conditions on technological quality of a workpiece	187
6.1. Dimension and shape accuracy	187
6.1.1. Dimension accuracy	187
6.1.2. Shape accuracy	197

6.2. Roughness and waviness	206
6.2.1. The influence of burnishing conditions on surface roughness .	206
6.2.2. The influence of burnishing conditions on surface waviness ...	229
6.3. Material ratio	233
6.4. Imperfections of burnished objects	237
6.5. Complex assessment of the surface layer and burnishing quality	244
6.5.1. Condition of the surface layer	244
6.5.2. Complex assessment of burnishing quality	249
Part II. Technology, tools and machining tools used in burnishing processes ...	253
7. Construction characteristics of burnishing elements	255
8. Selecting burnishing conditions	265
8.1. General guidelines regarding the selection of burnishing conditions	265
8.2. Conditions of thrust turning burnishing	269
8.2.1. Burnishing with flexible thrust	271
8.2.2. Burnishing with rigid thrust	285
8.3. Conditions of oscillating burnishing	290
8.4. Conditions of slide burnishing	292
8.5. Conditions of dynamic burnishing	296
9. Burnishing technology, tools and machine tools intended for outer cylindrical surfaces	299
9.1. Tools and machines for disc burnishing	305
9.2. Tools and equipment for roller burnishing	335
9.3. Tools and equipment for ball burnishing	347
9.4. Tools and machining devices for slide smoothing	354
10. Burnishing technology and machine tools intended for inner cylindrical surfaces	364
10.1. Tools and machining devices for roller burnishing.....	371
10.2. Tools for ball burnishing	399
10.3. Tools for dynamic burnishing	402
10.4. Tools for sliding burnishing	403
11. Burnishing technology, tools and machine tools for flat and shaped surfaces	409
11.1. Tools for disc burnishing	410
11.2. Tools and machines for roller burnishing	411
11.3. Tools for ball burnishing	416
11.4. Tools for slide burnishing	430
12. Burnishing technology, tools and machine tools for shaped surfaces	432
12.1. Tools and machine tools for disc burnishing	432
12.2. Tools for roller burnishing	444
12.3. Tools for ball burnishing and slide smoothing	451
13. Burnishing technology and equipment for heavy elements	464
13.1. Burnishing of shafts	464
13.2. Hole burnishing	471
13.3. Burnishing of flat surfaces	474
13.4. Burnishing of shaped surfaces	475
14. Application of burnishing in machinery repair and maintenance	479

14.1. Regeneration of shafts with electromechanical burnishing 481

14.2. Burnishing hardfaced surfaces 485

14.3. Burnishing galvanized surfaces 490

15. Application of burnishing for smoothing machining of wood 496

16. Application of burnishing machining in Flexible Manufacturing Systems . 500

Summary 505

Bibliography 506

APPENDIX 1 517

APPENDIX 2a 518

APPENDIX 2b 525