INDEX

Acceleration
  force, 35, 99
  vibration, 8, 34
Acoustical vibration, 131
Agitator vibration, 51, 241
Air gap, 111, 163
Alignment, couplings, 51, 102, 103
Allowable amplitudes, 29, 47, 103, 122, 185
Amplitude calculations, 45
Attenuation, 105, 136, 162
Area moment of inertia, 15
Axial multi-mass, 176

Balancing, 99, 187
Balance quality, 101, 190
Banded V belts, 97, 196, 275
Beach marks, 255, 267
Beam vibration, 19
Bearing failures, 83, 264
Bearing life calculations, 67, 83, 231
Bearing loading, 231
Bearing survival, 67
Beats, 23, 92, 67
Bending stress, 64
Best efficiency point (BEP), 107
Bode plot, 40
Bolt failures, 84, 259
Bowed shaft, 210
Braking inertia effect, 153
Brinelling, 232, 249
Brittle fracture, 220, 254, 269
Bump test, 59, 60
Bush holder wear, 251

Campbell diagram, 31
Cantilever beam, 14, 58, 88
Cascade diagrams, 36
Case vibration, 104, 227
Centrifugal force, 71, 99, 104, 223
Centrifugal pump vibration, 105, 111
Centrifuge vibration, 67, 223
Clearance effect, 19, 214
Coll spring, 14, 75, 246
Combining springs, 9, 145
Compressor vibration, 185, 258
Connecting rod, 262
Control valve vibration, 130
Conveyor cracking, 205, 248, 251
Cooling towers, 114, 252
Corrosion, 271
Coupled systems, 23
Couples, 113
Coupling fit loss, 157
Coupling types, 116, 164, 230
Crack growth, 139, 219, 248
Crankshafts, 146, 250
Creep, 269
Critical speed, 36, 183

Damping constant, 8, 49
Data analysis, 132
Dead zone, 19
Deck vibration, 60, 67
Destructive pitting, 209
Displacement, vibration, 7
Differential equation, 56, 93
Drill string, 160
Dynamic loading, 160
Eccentricity, 51, 100, 111, 222
Elastomer coupling, 165
Elusive failures, 207
Embedment, 85
Endurance limit, 271
Equivalent diameter shaft, 195
Equivalent system, 11, 73, 147, 193
Erosion, 106
Excitation frequency, 28
Excitation sources, 28, 48
Extruder blow back, 235
Extruder failure, 235, 239, 257
False brinelling, 83, 249
Fan instability, 90
Fast Fourier transform (FFT), 29, 43
Fatigue calculations, 77
Fatigue failures, 270
Firing order, 152
Fixed end beam, 19
Fixed tube exchanger, 126
Flat plate spring constant, 14
Flat plate vibration, 14, 60
Flexible rotor, 187
Flow induced vibration, 86
Fluid forces, 88
Fracture surfaces, 266
Fretting, 79, 247
Friction, 94
G forces, 35, 99, 235
Gear failures, 113, 208, 225, 229
Gear hammering, 155
Gear mesh stiffness, 145, 157
Gear ratio effect, 154, 158
Gear reaction forces, 113
Grid closure, 152, 170
Grinding vibration pattern, 54
Gusset support, 122, 124, 264
Harmonics, 29
Heat affected zone (HAZ), 270
Heat exchanger vibration, 126, 138
Helmholtz resonator, 134
Holzer method, 174
Human response vibration, 36
Huck bolt system, 85, 252
Hydrodynamic bearings, 197
Hydrogen embrittlement, 272
Impact loading, 123, 160, 232
Imprints, 232

Inertia
area moment, 15
mass moment, 177
Internal combustion engines, 144, 146
Interpreting fatigue failures, 245
Isolation, 49, 70

Kinetic energy, 74, 131, 218, 238

Life, 67, 83, 231
Life, graph, 67, 231
Linear spring constants, 13
Lissajous plot, 42
Low cycle vibration, 203
Lumped mass, 11, 48, 143, 217

Machine structure vibration, 29
Magnification factor, 10, 47
Mass elastic diagram, 147
Mass moment of inertia, 157, 177
Metallurgical examination, 274
Misalignment, 102
Misalignment force, 62
Mixers, 72, 241
Moment calculation, 65
Motor torque, 66, 206
Motor vibration, 110, 111, 114
Multi-mass systems, 174

Natural frequency, 21
Noise, 88
Nominal stress, 207, 258, 267
Nonlinear, 212
NPSH, 105

Off-resonance, 47
Oil film stiffness, 197
Oil film thickness, 197
Oil lubrication, 197
Oil viscosity, 199
One mass system analysis, 11, 21, 49, 53, 56, 60,
67, 72, 73, 155
Orbit plot, 40
Order, 36, 149, 152

Palmer–Miner rule, 78, 171
Peak acceleration, 34
Peak displacement, 34
Peaking, 205
Peak velocity, 34
Pendulum frequency, 21, 54, 72
Piezoelectric transducer, 40
Piping loads, 128
Piping vibration, 121
Pitting, 209, 247, 270
Plastic deformation, 209
Plug weld, 221, 255
Potential energy, 218, 237
Power surge, 152
Pressure dam bearings, 201
Pressure pulsations, 46, 89
Propellers, 46, 146, 155
Pump vibration, 105, 109, 111, 201

Questions, 12
Quill shaft, 168

Rat holes, 264
Random vibration, 9
Reciprocating compressors, 53, 259
Relaxation, 85
Residual stress, 270
Resonance, 47
Rigid rotor, 187
Risk, 275
Rocking mode, 57
Roller bearing, 231, 266
Rotary dryer, 205, 219
Rotor systems, 180

Screening chart, piping, 122
Screw compressor vibration, 33, 160
Seal chipping, mechanical, 52, 90
Self excited vibration, 93
Sensitivity analysis, 162, 192
Shaft stiffness, 10, 142, 157
Shaft vibration, 254
Shear lip, 261
Shear stress, 64, 174
Shell, bearing, 198
Shock pulse method (SPM), 37
Shotgun approach, 208
Simple support beam, 19
Single degree of freedom (SDF), 4
Slip-jerk, 218
Slipper failure, 234, 258
Slip-stick, 92
Slug flow, 130, 136
Socket welds, 256, 273
Soft foot, 30, 112
Spectrum analysis, 27, 29, 107
Spill back line, 186
Spline failures, 247
Spring constant, 13, 157
Spring failures, 246
Spring mass system, 4
Spring systems, 6
Spring support rotor, 183

Spring surge, 75
Stack vibration, 87
Start up torque, 163
Static amplitude, 21, 48
Static frequency, 21
Steady bearing, 72
Steam sparger, 138
Steam turbine vibration, 6, 257
Stonewall, 186
Stop drill hole, 262
Stress calculations, 64
Stress concentration, 254, 262
Structural vibration, 29, 33, 53, 67
Surge compressor, 185
Surge volume, 135

Thermally bowed shaft, 210
Three mass system analyses, 158
Through critical, 171
Tilt mode, 57, 181
Tilted pad bearings, 197
Time base plot, 40
Torque acceleration, 171
loading, 113, 160, 206
Torsiograph, 64, 168
Torsional failures, 215, 246, 256
Torsional mass moment of inertia, 157, 177
Torsional spring constants, 157
Torsional stress, 150
Torsional vibration, 141
Torsion continuous shaft, 163, 173
Transducers, 38
Transient vibration, 9, 152, 160, 171
Transmissibility, 49
Tube vibration, heat exchanger, 126, 138
Tuning, 151
Turbo machinery vibration, 179
Two diameter shafts, 195
Two mass system analysis, 16, 143, 144, 146, 152, 155, 162
Two phase flow, 136, 208
U tube exchanger vibration, 138
Unbalance force, 99

Valve trim vibration, 130
V belt vibration, 97
Vehicle vibration, 57
Velocity, vibration, 7
Vibration absorber, 16
Vibration analysis, 31, 33, 104
Vibrating conveyors, 251
Vibration diagnosis, 31, 33, 132
Vibration guidelines, 112, 122
Vibration history, 279
Vibration testing, 33, 168
Vibrating service, 130
Viscosity, 199
Viscous damper, 147, 149
Vortex breaker, 108

Vortexing, 86, 107

Waterfall diagram, 36
Water hammer, 123
Wear, 239, 251, 266
Weld fatigue, 79, 255, 273
Weld strength, 205, 273
WR square, 157

Yield strength, 233, 255