

Table of Contents

Preface

Chapter 1: Fatigue Life Prediction

Low Cycle Fatigue Life of Martensitic Cast Steel after Ageing G. Golański, S. Mroziński and K. Werner	3
Experimental Verification of the Analytical Method for Estimated S-N Curve in Limited Fatigue Life P. Strzelecki and J. Sempruch	11
Fatigue Life Calculation in Conditions of Wide Spectrum Random Loadings – The Experimental Verification of a Calculation Algorithm on the Example of 41Cr4 Steel B. Ligaj and G. Szala	17
The Fictitious Radius as a Tool for Fatigue Life Estimation of Notched Elements G. Robak, M. Szymaniec and T. Łagoda	27
Determination of Fatigue Life on the Basis of Experimental Fatigue Diagrams under Constant Amplitude Load with Mean Stress A. Niesłony and M. Böhm	33
Applying a Stepwise Load for Calculation of the S-N Curve for Trabecular Bone Based on the Linear Hypothesis for Fatigue Damage Accumulation T. Topoliński, A. Cichański, A. Mazurkiewicz and K. Nowicki	39
Concept of Fatigue for Determining Characteristics of Materials with Strengthening E. Marcisz, A. Niesłony and T. Łagoda	43

Chapter 2: Fatigue Properties of Materials

Material Properties Investigations With the Use of Microspecimen D. Boroński	51
Effect of Microstructure on Rolling Contact Fatigue of Bearings T.Z. Woźniak, J. Jelenkowski, K. Rozniatowski and Z. Ranachowski	55
Determination of the Fatigue Properties of Aluminum Alloy Using Mini Specimen T. Tomaszewski and J. Sempruch	63
Description of Cyclic Properties of Steel in Variability Conditions of Mean Values and Amplitudes of Loading Cycles G. Szala and B. Ligaj	69
The Comparison of Cyclic Properties of X5CrNi18-10 Steel in the Range of Low-Cycle Fatigue in Conditions of Stress and Strain Control B. Ligaj and G. Szala	77
Method of Determining the Initial Stiffness Modulus for Trabecular Bone under Stepwise Load T. Topoliński, A. Cichański, A. Mazurkiewicz and K. Nowicki	84

Chapter 3: Fatigue of Welded Structures

Fatigue Test Welded Joints Steel S960QL C. Goss and P. Marecki	93
Influence of the Notch Rounding Radius on Estimating the Elastic Notch Stress Concentration Factor in a Laser Welded Tee Joint K. Niklas and J. Kozak	100
Fatigue Life Tests of Explosively Cladded Steel-Titanium Bimetal A. Kurek and A. Niesłony	106
Simulation of Tensile Test of the 1/2Y Welded Joint Made of Ultra High Strength Steel J. Galkiewicz	110

Identification of Efficient Material S-N Curve for Steel Welded Joints Ł. Blacha and A. Karolczuk	118
Residual Stresses in Steel-Titanium Composite Manufactured by Explosive Welding A. Karolczuk, K. Kluger, M. Kowalski, F. Żok and G. Robak	125
The Impact of the Laser Welding Speed on the Mechanical Properties of Joints in Multilayer Pipes S. Mroziński and M. Piotrowski	133

Chapter 4: Temperature and Thermo-Mechanical Fatigue

Model of the Deformation Process under Thermo-Mechanical Fatigue Conditions J. Okrajni and G. Junak	143
Influence of Temperature on the Cyclic Properties of Martensitic Cast Steel S. Mrozinski and R. Skocki	150
Use of Thermography for the Analysis of Strength Properties of Mini-Specimens A. Lipski and D. Boroński	156
Variations of the Specimen Temperature Depending on the Pattern of the Multiaxial Load – Preliminary Research A. Lipski and D. Skibicki	162

Chapter 5: Multiaxial Fatigue

Steel X2CrNiMo17-12-2 Testing for Uniaxial, Proportional and Non-Proportional Loads as Delivered and in the Annealed Condition D. Skibicki, J. Sempuch and Ł. Pejkowski	171
Estimation of Fatigue Life of Materials with Out-of-Parallel Fatigue Characteristics under Block Loading M. Kurek and T. Łagoda	181
Criteria Evaluation for Fatigue Life Estimation under Proportional and Non-Proportional Loadings Ł. Pejkowski and D. Skibicki	189

Chapter 6: Fatigue Crack Growth

Fracture Toughness of Structural Members A. Neimitz	195
Fatigue Crack Growth Rates of S235 and S355 Steels after Friction Stir Processing D. Kocańda, V. Hutsaylyuk, T. Ślęzak, J. Torzewski, H. Nykyforchyn and V. Kyrlyliv	203
An Experimental Investigation on Crack Initiation and Growth in Aircraft Fuselage Riveted Lap Joints A. Skorupa, M. Skorupa, T. Machniewicz and A. Korbel	211
Application of Digital Image Correlation in Fatigue Crack Analysis T. Marciniak, Z. Lutowski, S. Bujnowski, D. Boroński and T. Giesko	218
Dual-Band Experimental System For Subsurface Cracks Testing T. Marciniak, Z. Lutowski, S. Bujnowski, D. Boroński and P. Czajka	222
Dual-Camera Vision System for Fatigue Monitoring T. Giesko	226
Modeling of Crack Growth in Steels J. Jackiewicz	233