

Fatigue Design 2013

Procedia Engineering Volume 66

**Senlis, France
27-28 November 2013**

Editors:

F. Lefebvre

ISBN: 978-1-63266-332-0

TABLE OF CONTENTS

Preface	1
<i>Mansour Afzali, Fabien Lefebvre</i>	

PLENARY SESSION

Assessment Of Existing Steel Structures – Recommendations For Estimation Of The Remaining Fatigue Life	3
<i>Bertram Kühn</i>	
Reliable Fatigue Design, By Rigid Rules, By Magic Or By Enlightened Engineering	12
<i>Thomas Svensson, Pär Johannesson</i>	
Assessment Of Very High Cycle Fatigue (VHCF) Effects In Practical Applications	26
<i>Manfred Bacher-Hoechst, Stephan Issler</i>	

SESSION 1: WELDED COMPONENTS AND STRUCTURES

Comparison Between The Eurocode For Fatigue Of Steel Structures, En 1993-1-9, And The Eurocode For Fatigue Of Aluminium Structures, En 1999-1-3	34
<i>Johan Maljaars, Mladen Luki?, Frans Soetens</i>	
S-N Curves For Welded, Non-Welded Or Improved Welded Details Of Marine Structures	49
<i>Guy Parmentier, Michel Huther</i>	
Influence Of Weld Defects On The Fatigue Resistance Of Thick Steel Plates	62
<i>P. Schaumann, M. Collmann</i>	
Geometrical Influence Of A Butt Weld In The Low Cycle Fatigue Regime	73
<i>E. Lang, J. Rudolph, H. Th. Beier, M. Vormwald</i>	
FEA Structural Stress Of Modalohr System For Semi-Trailer Rail Transportation: Weld Root Fatigue Focus	79
<i>Patrice Klein, Didier Turlier, Jacques Ober</i>	
Fatigue Tests Of Axially Loaded Butt Welds Up To Very High Cycles	88
<i>P. Schaumann, S. Steppeler</i>	
A Guideline For Fatigue Strength Improvement Of High Strength Steel Welded Structures Using High Frequency Mechanical Impact Treatment	98
<i>Gary B. Marquis, Zuheir Barsoum</i>	
Use Of Martensitic Stainless Steel Welding Consumable To Substantially Improve The Fatigue Strength Of Low Alloy Steel Welded Structures	108
<i>Fabrice Scandella, Nicolas Cavallin, Philippe Gressel, Jessy Haouas, Laurent Jubin, Fabien Lefebvre, Isabel Huther</i>	
TIG-Dressing Of High Strength Butt Welded Connections – Part 2: Physical Testing And Modelling	126
<i>S.H.J. van Es, M.H. Kolstein, R.J.M. Pijpers, F.S.K. Bijlaard</i>	
Fatigue Designed CL-Cutting Shape: A New Economic Steel-Concrete Connection System And Some Applications For Bridges	138
<i>Jacques Berthelémy</i>	
Assessment Of The Surface Hardening Effects From Hammer Peening On High Strength Steel	150
<i>C. Revilla-Gomez, J.-Y. Buffière, C. Verdu, C. Peyrac, L. Daflon, F. Lefebvre</i>	
Fatigue Strength Of HFMI Treated Structures Under High R-Ratio And Variable Amplitude Loading	161
<i>Eeva Mikkola, Matthew Doré, Mansoor Khurshid</i>	
Diode Laser Weld Toe Re-Melting As A Means Of Fatigue Strength Improvement In High Strength Steels	171
<i>Christoph Gerritsen, Sofie Vanrostenberghe, Matthew Doré</i>	
Residual Stresses In Welded Components Following Post-Weld Treatment Methods	181
<i>Lasse Suominen, Mansoor Khurshid, Jari Parantainen</i>	
Fatigue Strength Improvement Of Welded Structures Using New Low Transformation Temperature Filler Materials	192
<i>A.A. Bhatti, Z. Barsoum, V. van der. Mee, A. Kromm, T. Kannengiesser</i>	

Implementing High Frequency Mechanical Impact In Industrial Components: A Case Study	202
<i>Bertil Jonsson, Yang Shin, Thomas Däuwel, Christoph Gorges</i>	
TIG-Dressing Of High Strength Steel Butt Welded Connections – Part 1: Weld Toe Geometry And Local Hardness	216
<i>S.H.J. van Es, M.H. Kolstein, R.J.M. Pijpers, F.S.K. Bijlaard</i>	

SESSION 2: ENVIRONMENTAL EFFECT AND FATIGUE DESIGN

Influence Of Temperature And Long Term Ageing On The Fatigue Crack Growth In A Precipitation Hardened Martensitic Stainless Steel	226
<i>L. Dimithe Aboumou, G. Henaff, M. Arzaghi, S. Pommier</i>	
Influence Of Surface Finish In Fatigue Design Of Nuclear Power Plant Components	233
<i>Thibault Poulain, José Mendez, Gilbert Henaff, Laurent DE Baglion</i>	
High Cycle Thermal Fatigue Damage Prediction In Mixing Zones Of Nuclear Power Plants: Engineering Issues Illustrated On The Father Case	240
<i>Stéphane Courtin</i>	
Thermocracks®, A Specific Testing Machine For Evaluation Of The Thermal Fatigue Resistance Of Materials	250
<i>Gilles Regheere, Mathilde Collignon, Anne-Lise Cristol, Yannick Desplanques, Philippe Dufrenoy, David Balloy</i>	

SESSION 3: MANUFACTURING PROCESS AND FATIGUE DESIGN

Effect Of Microstructure On The Fatigue Behavior Of A Friction Stirred Channel Aluminium Alloy	264
<i>Catarina Vidal, Virginia Infante, Pedro Vilaça</i>	
Influence Of Surface Integrity Of 15-5PH On The Fatigue Life	274
<i>Vincent Chomienne, Catherine Verdu, Joël Rech, Frédéric Valiorgue</i>	
Influence Of The Base Material Strength And Edge Preparation On The Fatigue Strength Of The Structures Made By High And Ultra-high Strength Steels	282
<i>Risto Laitinen, Ilkka Valkonen, Jukka Kömi</i>	
A New Methodology For Designing Heat Treated Components In Fatigue	292
<i>Etieme Pessard, Franck Morel, Benjamin Abrivard, Philippe Delhaye</i>	
Fatigue Life Model For 7050 Chromic Anodized Aluminium Alloy	300
<i>Michel Chaussumier, Catherine Mabru, Rémy Chieragatti, Majid Shahzad</i>	

SESSION 4: FATIGUE CRACK PROPAGATION ASSESSMENT

Accelerated Fatigue Crack Growth In 6082 T651 Aluminium Alloy Subjected To Periodic Underloads	313
<i>Matthew J. Doré, Stephen J. Maddox</i>	
Estimation Of Notch Sensitivity And Size Effect On Fatigue Resistance	323
<i>Mirco D. Chapetti, Andrés O. Guerrero</i>	
Numerical Simulation Of The Total Service Life Time Of Steel Constructions Including Fracture Mechanic Concepts	334
<i>Gerhard Lener, Daniel Reiterer, Andreas Hauser</i>	
Probabilistic Prediction Of Fatigue Life Of Cracked Parts: Linear Elastic Fracture Mechanics Based Approach	343
<i>Pierre Boutet, François Hild, Fabien Lefebvre</i>	
Experimental And Numerical Study For Fatigue Life Prediction Of Bolted Connection	354
<i>M. Saranik, L. Jézéquel, D. Lenoir</i>	
Design Of Experiment Based On VMEA (Variation Mode And Effect Analysis)	369
<i>Kent Cronholm</i>	

SESSION 5: COMPLEX LOADING AND FATIGUE BEHAVIOUR

Breathing-Induced Fatigue In Thin-Walled Construction	383
<i>Miroslav Škaloud, Marie Zörnerová, Shota Urushadze</i>	
Multi-Parameter Fatigue Equivalence Loadings For Specification Applications	393
<i>Clément Roux, Xavier Lorang, Habibou Maitournam, Mac-Lan Nguyen-Tajan, Benoît Quesson</i>	
Use Of Multi-Scale Approach For Vehicle Weight Reduction Study	403
<i>Romain Paquet, David Lebaillif, Eric Petitpas</i>	

Modeling Of Hydrogen Transport In Rolling Contact Fatigue Conditions	415
<i>Yuri Kadin</i>	
Detection Of The Curves Based On Lateral Acceleration Using Hidden Markov Models	425
<i>Roza Maghsood, Pär Johannesson</i>	
Operation Of The Bois Plant Hydraulic Turbine In Bypass Operating Mode: Analysis Of Fatigue Behaviour	435
<i>Philippe Bryla, Marc Pillou, Mohamed Bennebach</i>	
Pile Fatigue Assessment During Driving	451
<i>Jean Chung, Régis Wallerand, Morgane Hélias-Brault</i>	
Laplace Processes For Describing Road Profiles	464
<i>Pär Johannesson, Igor Rychlik</i>	
The Mobility Of Principal Stress Directions In Crossland Criterion	474
<i>Bertin Soh Fotsing, Bienvenu Kenmeugne, Médard Fogue, Kevin M. Tsapi Tchoupou</i>	

SESSION 6: RELIABILITY APPROACHES IN FATIGUE DESIGN

Risk Based Fatigue Inspection Planning – State Of The Art	489
<i>Tom Lassen</i>	
Stress-Strength Interference Method Applied For The Fatigue Design Of Tower Cranes	500
<i>Simon Bucas, Pierre Rumelhart, Nicolas Gayton, Alaa Chateaneuf</i>	

SESSION 7: VIBRATION FATIGUE BEHAVIOUR

Fatigue Of Structures In Mechanical Vibratory Environment. From Mission Profiling To Fatigue Life Prediction	508
<i>M. Bennebach, H. Rognon, O. Bardou</i>	
Probabilistic Random Vibration Fatigue	522
<i>Baussaron Julien, Fouchez Bertrand, Yalamas Thierry</i>	
Multiaxial Load Situations In Random Vibration Fatigue – Phasing And Cross Correlation	530
<i>Michael Hack, Frank Zingsheim</i>	
Time Domain Analysis Method Of The Impulse Vibro-Acoustic Signal For Fatigue Strength Characterisation Of Metallic Material	539
<i>M.Z. Nuawi, A.R. Bahari, S. Abdullah, A.K. Ariffin, Z.M. Nopiah</i>	
Vibration Fatigue And Simulation Of Damage On Shaker Table Tests: The Influence Of Clipping The Random Drive Signal	549
<i>Frédéric Kihm, David Delaux</i>	

SESSION 8: FATIGUE DAMAGE MECHANISMS

On The Fatigue Reliability Of Hydroelectric Francis Runners	565
<i>Martin Gagnon, Antoine Tahan, Philippe Bocher, Denis Thibault</i>	
A New Model For Fatigue Damage Accumulation Of Austenitic Stainless Steel Under Variable Amplitude Loading	575
<i>S. Taheri, L. Vincent, J.-C. Le-roux</i>	
Quest For Fatigue Limit Prediction Under Multiaxial Loading	587
<i>Jan Papuga</i>	
Two-Scale Time Homogenization For Isotropic Viscoelastic- Viscoplastic Homogeneous Solids Under Large Numbers Of Cycles	598
<i>Sarra Haouala, Issam Doghri</i>	
Fatigue Damage Assessment Of Alternator Fans By EBSD	608
<i>J.-B. Vogt, J. Bouquerel, F. Léaux, F. Palleschi</i>	
Very High Cycle Fatigue For Single Phase Ductile Materials: Slip Band Appearance Criterion	615
<i>Ngoc Lam Phung, Nicolas Marti, Antoine Blanche, Nicolas Ranc, Véronique Favier, André Chrysochoos, N. Saintier, Fabienne Grégori, Brigitte Bacroix, Guillaume Thoquenne</i>	
Fatigue Damage Analysis On Aluminium Alloy Specimens Under Strain Loading Sequences Associating With The Kurtosis-Based Coefficient	626
<i>M.M. Padzi, S. Abdullah, M.Z. Nuawi, Z.M. Nopiah</i>	
Microplastic Limit Of Steels As A Means Of Fatigue Limit Determination	635
<i>Ing. ?ubomír Gajdoš, Ing. Martin Šperl, Jaroslav Kaiser, Václav Mentl</i>	

Occurrence Of Single And Double Slip Crossover Bands In Fatigued Alloys C460 And C22	643
<i>Aezeden Mohamed</i>	

SESSION 9: FATIGUE TESTING

Characterization Of Fatigue Damage In 304l Steel By An Acoustic Emission Method	651
<i>A. Ould Amer, A.-L. Gloanec, S. Courtin, C. Touze</i>	
Thermal Measurements On Elastomeric Materials: From The Characterization Of The Dissipation Gradients To The Prediction Of The Fatigue Properties	661
<i>I. Masquelier, Y. Marco, V. Le Saux, S. Calloch, P. Charrier</i>	
Experimental Facility For High Cycle Thermal Fatigue Tests Using Laser Shocks	669
<i>L. Vincent, M. Poncelet, S. Roux, F. Hild, D. Farcage</i>	
Fast Fatigue Properties Identification By “Self-Heating” Method: Application To Automotive Welded Joints	676
<i>Pierrick Florin, Matteo Facchinetti, Cédric Doudard, Sylvain Calloch</i>	
DAMAGE: Experimental Validation And Prospects	684
<i>Pierre Gaborit, Nicolas Gilblas, Alain Pyre, Rodrigue Desmorat</i>	
Fast Characterization Of Fatigue Properties Of An Anisotropic Metallic Material: Application To A Puddled Iron From A Nineteenth Century French Railway Bridge	689
<i>L. Gallegos Mayorga, S. Sire, S. Calloch, S. Yang, L. Dieleman, J.-L. Martin</i>	

SESSION 10: COMPOSITES AND ELASTOMERS FATIGUE BEHAVIOUR

Rapid Determination Of The High Cycle Fatigue Limit Curve Of Carbon Fiber Epoxy Matrix Composite Laminates By Thermography Methodology: Tests And Finite Element Simulations	697
<i>Laurent Gornet, Ophélie Wesphal, Christian Burtin, Jean-Luc Bailleul, Patrick Rozycki, Laurent Stainier</i>	
Influence Of Elastomers Formulation On Fatigue Crack Growth Properties	705
<i>Nicolas Roche, Laurent Perier</i>	
Low-Cycle Fatigue Of The Light Advanced Materials	713
<i>Yakov B. Unigovski, Ariel Grinberg, Emmanuel M. Gutman</i>	
Fatigue Damage Modelling Of Continuous E-Glass Fibre/Epoxy Composite	723
<i>Rim Ben Toumi, Jacques Renard, Martine Monin, Pongsak Nimdum</i>	
Fast Prediction Of The Fatigue Behavior Of Short Fiber Reinforced Thermoplastics From Heat Build-Up Measurements	737
<i>L. Serrano Abello, Y. Marco, V. Le Saux, G. Robert, P. Charrier</i>	
Damage Of Composite Materials	746
<i>Thomas Jollivet, Catherine Peyrac, Fabien Lefebvre</i>	
Multi-Scale Damage Model For Mechanical High Cycle Fatigue (HCFF) Of Short Glass Fibre Reinforced Thermoplastics (SGFRTP)	759
<i>Anouar Krairi, Issam Doghri</i>	

SESSION 11: MECHANICAL BEHAVIOUR IN CONTACT FATIGUE

Modelling Of Surface Initiated Rolling Contact Fatigue Damage	766
<i>Dave Hannes, Bo Alfredsson</i>	
XFEM Crack Propagation Under Rolling Contact Fatigue	775
<i>B. Trollé, M.-C. Baietto, A. Gravouil, S.H. Mai, T.M.L. Nguyen-Tajan</i>	
Experimental Analysis And Modeling Of The Crack Arrest Condition Under Severe Plastic Fretting Fatigue Conditions	783
<i>Camille Gandiolle, Siegfried Fouvry</i>	
Characterization Of Surfaces Obtained By Precision Hard Turning Of AISI 52100 In Relation To RCF Life	793
<i>Nabil Jouini, Philippe Revel, Guillaume Thoquenne, Fabien Lefebvre</i>	
Prediction Of The Fretting Fatigue Crack Nucleation Endurance Of A Ti-6V-4Al/Ti- 6V-4Al Interface: Influence Of Plasticity And Tensile/Shear Fatigue Properties	803
<i>R. Ferre, S. Fouvry, B. Berthel, R. Amargier, J.A. Ruiz-Sabariego</i>	
Author Index	