ASTM International Symposium on Creep-Fatigue Interactions: Test Methods and Models

Sponsored by ASTM Committee E08 on Fatigue and Fracture in cooperation with ICF and EPRI

November 17-19, 2010
Grand Hyatt San Antonio
San Antonio, Texas, USA

Symposium Co-Chairs:
- Ashok Saxena
  University of Arkansas
  Fayetteville, AR
  USA
- Bilal Dogan
  EPRI
  Charlotte, NC
  USA

WEDNESDAY, NOVEMBER 17, 2010

8:15 AM  
Opening Remarks
A. Saxena and B. Dogan, Symposium Co-Chairs

PLENARY SESSION-I

Session Chair: Bilal Dogan

8:30 AM  
Comparative Study of Life Prediction Methods for Creep-fatigue Interaction
Y. Takahashi, Central Research Institute of Electric Power Industry, Japan; B. Dogan and D. Gandy, Electric Power Research Institute, Charlotte, NC, USA

9:15 AM  
Component Assessment Data Requirements from Creep-fatigue Tests
S. Holdsworth, EMPA, Swiss Federal Laboratories for Materials Testing and Research, Dbendof, Switzerland

10:00 AM  
BREAK
CREEP-FATIGUE OF P91/92 STEELS-I

Session Co-Chairs: Stuart Holdsworth and Laura Carroll

10:30 AM
Investigation of Creep-fatigue Behavior of Ferritic and Martensitic Steels from Tests with Long Hold Times
A. Klenk, J. Bussmann, and K. Maile, Materialpruefungsanstalt Universitaet, Stuttgart, Germany; B. Dogan, EPRI, Charlotte, NC, USA

10:55 AM
Modeling Creep-Fatigue Behavior in G91 Steel by Damage Rate Equation
M. Li, S. Majumdar, and K. Natesan, Argonne National Laboratory, Argonne, IL, USA

11:20 AM
The Occurrence of Periodic Mechanism of Creep Crack Path for P92
Y. Nagumo, A.T. Yokobori, Jr., R. Sugiura, and T. Matsuzaki, Tohoku University, Sendai, Japan

11:45 AM
Preliminary Investigation of Creep-fatigue Damage in Modified 9Cr 1Mo Ferritic/Martensitic Steels using the Stress Modified Ductility Exhaustion Approach
W. M Payten and L. Edwards, Australian Nuclear Science and Technology Organization, NSW, Australia; M. W. Spindler, British Energy, Gloucester, UK

12:10 PM
Creep-Fatigue Crack Initiation and Growth Behaviors for P92 Using Circular Notched Specimen
R. Sugiura, A. T. Yokobori Jr., T. Nakagawa, T. Matsuzaki, and I. Nonaka, Tohoku University, Sendai, Japan; T. Adachi, Senshu University, Ishinomaki, Japan; Y. Hasegawa, Nippon Steel Corporation, Futtsu, Japan

12:35 PM LUNCH

KEYNOTE SESSION-I

Session Chair: Jack Telesman

2:00 PM
Environmental Effects on High Temperature Creep-Fatigue Behavior of Alloy 617
L. J. Carroll and R. N. Wright, Idaho National Laboratory, Idaho Falls, ID USA; C. Cabet, CEA, DEN, DPC, SCCME, Gif-sur-Yvette, France

2:30 PM
Fracture Mechanics Creep-fatigue Crack Growth Tests in a Range of Steels
A. N. Mehdmanparast, C. M. Davies, K. M. Nikbin, Imperial College, London, UK

3:00 PM BREAK
CREEP-FATIGUE OF P91/92 STEELS-II

Session Chair: Kamran Nikbin

3:30 PM
Creep-Fatigue of High Temperature Materials and Components in Power Generation- A Utility Perspective
B. Dogan, K. Coleman, and V. Viswanathan, EPRI, Charlotte, NC, USA

3:55 PM
Improvement of Inelastic Analysis and Life Prediction Models for Modified 9Cr-1Mo Steel under Creep-Fatigue Interaction
Y. Takahashi, Central Research Institute of Electric Power Industry, Kanagawa, Japan

ENVIRONMENTAL EFFECTS ON CREEP-FATIGUE

Session Co-Chairs: Jeff Evans and Hans-Jurgen Christ

4:20 PM
Effects of the Environment on the Crack Propagation Behaviour of IN718 in the Temperature Range of Dynamic Embrittlement
K. Wackermann and H.-J. Christ, Universität Siegen, Siegen, Germany; and U. Krupp, Fachhochschule Osnabrück, Osnabrück, Germany

4:45 PM
Influence of Protective Coatings on Damage and Lifetime of Alloy 247 DS in Thermo-Mechanical Fatigue and Bending Tests
T. Beck, O. Trunova, and L. Singheiser, Research Centre Juelich, Juelich, Germany

5:10 PM
Effect of Creep and Oxidation on the Isothermal and Thermomechanical Fatigue Behavior of an Austenitic Stainless Steel
H.-J. Christ, Universität Siegen, Siegen, Germany

5:35 PM Symposium Adjourns for the day
THURSDAY, NOVEMBER 18, 2010

PLENARY SESSION - II

Session Chair: Ashok Saxena

8:15 AM

Opening Remarks
A. Saxena and B. Dogan

8:30 AM

Creep Fatigue Behavior of Creep Strength Enhanced Ferritic Steels
J. Parker, Structural Integrity Associates, Inc, Oakville, ON, Canada

9:15 AM

Influence of Stress Relaxation on Creep-Fatigue Behavior of Nickel-based Superalloys
J. Telesman, T. P. Gabb, L. J. Ghosn, and C. K. Sudbrack, NASA Glenn Research Center, Cleveland, OH, USA

10:00 AM BREAK

CREEP-FATIGUE MODELS

Session Co-Chairs: Bob Ainsworth and Yukio Takahashi

10:30 AM

Experimental and Numerical Investigations on Multi-axial Creep-fatigue
A. Klenk and K. Maile, Universitaet Stuttgart, Stuttgart, Germany

10:55 AM

Advanced Ductility Exhaustion Methods for the Calculation of Creep Damage during Creep-Fatigue Cycling
M. W. Spindler, British Energy, Gloucester, UK; and W. M. Payten, Australian Nuclear Science and Technology Organization, NSW, Australia

11:20 AM

Estimation Scheme of C_t-parameter Correlating Creep-Fatigue Crack Growth of Transversely Isotropic Materials,
K. B. Yoon and Y. W. Ma, Chung Ang University, Seoul, Korea (Republic of South)

11:45 AM

Creep-Fatigue at High Temperature of Notched Single Crystal Superalloys
M. Filippini, Politecnico di Milano, Milano, Italy

12:10 PM

Probabilistic Approach for Creep-fatigue Crack Growth Data Analyses
Z. Wei, R. E. Kurth, and M. J. Tefend, Battelle Memorial Institute, Columbus, OH, USA; K. M. Nikbin and C. M. Davis, Imperial College London, UK
KEYNOTE SESSION II

Session Chair: Mike Spindler

2:00 PM
Fracture Life Law of one Directionally Solidified and Poly-crystal Nickel-Based Super Alloys (CM247LC and IN100) Under Creep-Fatigue Conditions Based on Non Equilibrium Science
T. Yokobori, Jr., H. Takeuchi, S. Hosono, and R. Sugiura, Tohoku University, Sendai-shi, Miyagi, Japan; and D. Kobayashi, Chubu Electric Power Company, Nagoya, Aichi, Japan

2:30 PM
Modeling Creep-fatigue Deformation Behavior of Ni-base Superalloys using Crystal Viscoplasticity
R. W. Neu, Georgia Institute of Technology, Atlanta, Georgia, USA

CREEP-FATIGUE MODELS (CONTINUED)

Session Chair: Mike Spindler

3:00 PM BREAK

3:30 PM
Retrieving Archival Data for Evaluation of Gr 91 Creep-fatigue Damage Models
R. W. Swindeman, Cromtech, Inc., Oak Ridge, TN, USA

CREEP-FATIGUE IN NI-BASE ALLOYS-II

Session Co-Chairs: Richard Neu and Toshimitsu Yokobori

3:55 PM
Mechanical Behavior of SFR Materials: Developments in Support of Defect Assessment, Structural Integrity and Life Time Evaluation
O. Ancelet and S. Marie, CEA, DEN/DANS/DM2S/SEMT/LISN, Gif-sur-Yvette, France

4:20 PM
Creep and Subsequent Low Cycle Fatigue of Single Crystalline Ni-base Superalloy CNSX-4
H. Klingelhoffer, Federal Institute of Materials Research and Testing, Berlin, Germany; and A. Epishin, T. Link, and B. Fedelich, Technical University of Berlin, Germany

4:45 PM
Creep-Fatigue Crack Propagation in the Post Service Gas Turbine Vane
M. Okazaki, M. Sakaguchi, S. Yamanobe, Nagoaka Institute of Technology, Nigata, Japan; and K. Namba, Mitsui Engineering & Shipbuilding CO., LTD, Okayama, Japan
5:10 PM  
**Effects of Dwell on the LCF Behavior of IN617**  
S. Shinde and P. Gravett, Siemens Energy Inc., Orlando, FL, USA

5:35 PM  
**SYMPOSIUM ADJOURNS FOR THE DAY**

6:30 PM  
**SYMPOSIUM BANQUET**  
All Symposium attendees are cordially invited to the banquet.

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**FRIDAY, NOVEMBER 19, 2010**

**PLENARY SESSION III**

Session Chair:

8:15 AM  
**Opening Remarks**  
A. Saxena and B. Dogan

8:30 AM  
**Models for Small Crack Growth under Creep-fatigue**  
R. P. Skelton, Consultant, Guildford, UK

9:15 AM  
**Creep Crack Growth under Complex Loading**  
R. A. Ainsworth, D. W. Dean, and P. J. Budden, British Energy – part of EDF Energy, Gloucester, UK

10:00 AM  
**BREAK**

**CREEP-FATIGUE TEST METHODS**

Session Co-Chairs: Ryan Morrissey and Andreas Klenk

10:30 AM  
**Test System Development for Creep Fatigue Durability Assessment of Thin Metallic Sheets**  
R. J. Morrissey and R. John, US Air Force Research Laboratory, Wright Patterson AFB, OH, USA

10:55 AM  
**Evaluation of Creep, Creep-Fatigue Damage using Cyclic Indentation Testing**  
R. V. Prakash, Indian Institute of Technology Madras, Chennai, India
11:20 AM
The Effect of Hold Time on Fatigue Crack Growth under Biaxial Loading
V. Shlyannikov, Kazan Energy Research Center, Kazan, Russia; and R. Sunder, BiSS Research, Bangalore, India

11:45 AM
Development of ASTM Standards for Creep-Fatigue Crack Formation and Growth
A. Saxena, University of Arkansas, Fayetteville, AR, USA; and B. Dogan, EPRI, Charlotte, NC, USA

12:05 PM
Closing Remarks
A. Saxena and B. Dogan, Symposium Co-Chairs

12:15 PM SYMPOSIUM ADJOURNS