Fatigue Damage of Materials
Experiment and Analysis

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FIRST INTERNATIONAL CONFERENCE ON
FATIGUE DAMAGE OF MATERIALS
EXPERIMENT AND ANALYSIS

FATIGUE DAMAGE OF MATERIALS

Organised by
Wessex Institute of Technology, UK

in collaboration with
Ryerson University, Canada

Fatigue Damage of Materials
Experiment and Analysis

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Preface

Engineering materials are subjected to fatigue loading in a wide variety of applications in aeronautical, automotive, nuclear plant, petroleum and transportation industries. The extensive use of engineering materials over such a range of applications plus the cost involved in fatigue failure of materials and structures has resulted in an increasing awareness of the importance of damage and durability under cyclic loading conditions. It has recently been estimated that the annual cost of premature failures due to fatigue is well over 100 billion dollars per year.

The First International Conference on Fatigue Damage of Materials (FDM) held in Toronto, Canada (July 14-16, 2003) aimed to bring together both fatigue researchers and engineers to review and discuss the recent advances in the development of methods and approaches to predict fatigue performance of materials and structures. The conference focused on the state-of-the-art in fatigue testing and analysis methods; analytical and numerical criteria for crack growth rate, crack closure, fatigue damage and failure mechanisms, life prediction and design of engineering components subjected to fatigue loading and other related topics. Coverage was broad and included a range of materials and structures as well as different viewpoints and approaches to the fatigue analysis problem. Contemporary fatigue crack initiation and fatigue crack propagation methodologies were discussed, and problems in the areas of crack closure, loading spectrum, thermo-mechanical fatigue and creep, and multiaxial loading from both analytical and experimental point of views have been addressed. The present book contains papers, which were peer-reviewed and accepted for presentation at the conference and for inclusion in this book. This book includes 45 papers presented in eleven different sections of:

- Case studies on fatigue
- Computational methods
- Low cycle fatigue
- Fatigue crack initiation
- Fatigue crack propagation
- Fatigue damage analysis
- Fatigue of welded joints
- Multiaxial fatigue
- Small crack growth and threshold
- Statistical analysis of fatigue
- Thermo-mechanical fatigue and creep

The Conference was organized by the WIT, Southampton, U.K., in collaboration with Ryerson University, Toronto, Canada. The editors of this book are indebted to all authors for their excellent contributions and thankful to the Members of the International Scientific Advisory Committee who promoted the conference and helped in reviewing the papers submitted to this conference. Especial thanks go to Miss Amy D'Arcy-Burt who coordinated much of the activities related to the review process of the papers.

A. Varvani-Farahani and C. A. Brebbia,
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