Fatigue of Structures

10 - 12 March 2014
European Advanced Training Course
Cologne, Germany

INVENTUM GmbH
Hensstraße 3
53173 Bonn
GERMANY

Scope / Speaker

Fatigue cracks and failures due to alternating stresses often appear unexpected and can cause a large amount of damage, human as well as material and financial (image damage and liability). The share of fatigue damages of the total amount of mechanical damages is substantial so managing fatigue related problems in an appropriate way is essential.

A fatigue failure may have different causes, such as the material quality, production process and possible mistakes, structural (detail) design, erroneous use of strength and reliability analysis, underestimation of the load spectrum and abuse of the product.

The fatigue behavior of structures is determined by three aspects: Loads, material and geometry. In this course the significance of all three aspects are discussed.

It is obvious that there are many aspects that affect the resistance of a structure against fatigue. Managing and preventing problems due to fatigue should be considered as a key capability of a structural engineer. The course "Fatigue of Structures" has been designed and developed to meet the needs of structural engineers in designing, analyzing and maintaining structures. It presents the basic fundamentals of high cycle fatigue, as well as practical methods and case studies for meeting the durability of structures.

Course attendees are invited to bring a case from their own practice with them.

Chairman of the seminar is **Johannes J. Homan**, **M.Sc.**, Fatec Engineering, Bergschenhoek, The Netherlands.

Venue / General Information

The seminar takes place at the Maternushaus, Kardinal-Frings-Straße 1-3, 50668 Cologne, Germany.

Participation Fee for Members of the DGM: Personal members or 1 non-member from a member institute / member company: 1.050,- EURO (inkl. 19% VAT.)

Participation Fee: 1.150,- EURO (inkl. 19% VAT.)

The fee includes:
- Attendance of the seminar sessions
- Comprehensive handouts
- Refreshments during the coffee breaks
- Lunch

Cancellation policy:
Any cancellation is subject to a cancellation fee of 50% of the fees involved. After 1st February 2013 the entire fee is due. Substitution is possible at any time.

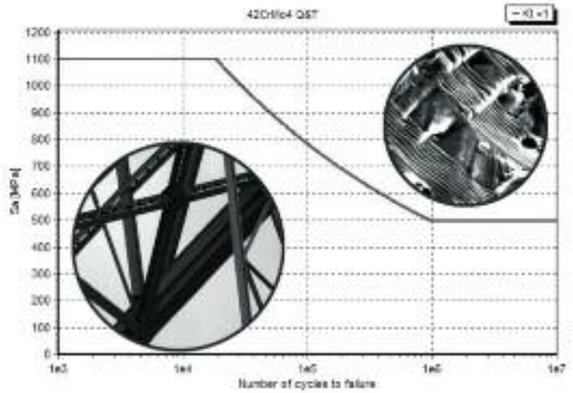
For further information please contact:

INVENTUM GmbH
Isabella Sittel-Sanna
Hensstraße 3
D-53173 Bonn
Germany
Phone: +49 (0) 151 46 44 59 80
E-Mail: fortbildung@inventum.de
http://www.inventum.de

DGM

European Advanced Training Course

Fatigue of Structures



10-12 March 2014

Cologne, Germany

Fatec Engineering (NL)

INVENTUM GmbH

www.inventum.de

Chairman of the seminar

M.Sc.
Johannes J. Homan

Monday

9:00 **Welcome / Introduction**

9:15 **Introduction to Fatigue**
Fatigue limit, S-N curves, fatigue diagrams

10:00 Coffee break

10:15 **Fatigue of materials – Phenomena**
Basis: What is fatigue and what are significant aspects affecting fatigue. Discussion on different phases in the fatigue life: cyclic slip, crack nucleation, micro crack growth and macro crack growth.

11:15 **Fatigue properties of materials**
Effect of material properties, mean stress, size and type of loading on fatigue strength.

12:15 Lunch break

13:15 **Residual stresses**
Effect of residual stresses (due to production processes, heat treatment, etc.) on fatigue.

14:00 **Effect of surface conditions**
Effect of surface layer conditions (e.g. roughness) and surface treatments on fatigue.

14:45 Coffee break

15:15 **Effect of Environment & Corrosion**

16:00 **Multi-axial fatigue**

16:30 **Low cycle fatigue**
Fatigue behavior at high loads (macroscopic yielding). Differences with high cycle fatigue.

17:00 End of the first day

18:00 Dinner

Tuesday

9:00 **Stress concentration factors**
Stress field around notch, determination stress concentration factors, size effect, effect of load cases, superposition of notches.

10:00 Coffee break

10:30 **Fatigue properties of structures**
Effect of notches on the fatigue limit and S-N curve.

11:45 **Load Spectra**
What is a load spectrum. How to determine a load spectrum. How to translate a load spectrum to stress cycles.

12:45 Lunch break

13:45 **Fatigue under variable amplitude loading**
Damage accumulation under variable amplitude loading (Miner rule, effect of fatigue limit).
VA loading: Tests vs. Miner rule prediction. Relative Miner rule.

14:45 Coffee break

15:15 **Fatigue prediction methods – Safe Life**
Prediction of fatigue endurance life using S-N data.

16:15 **Exercises & case studies**

17:00 End of the second day

Wednesday

9:00 **Design and safety concepts**
Safe life (including infinite life), fail safe and damage tolerance concepts.

9:45 **Fatigue prediction methods – Damage Tolerance**
Calculation of inspection intervals using crack growth methods (linear elastic fracture mechanics).

10:30 Coffee break

11:00 **Scatter in fatigue**
Scatter in material properties, accuracy of calculations.

11:30 **Fatigue testing**

12:00 **Fatigue of Joints**
The fatigue behavior of different types of joints (bolted, welded and bonded) are discussed with respect to discontinuities (large stress concentrations), load transfer (eccentricities), fretting, etc.

12:30 Lunch break

13:30 **Fatigue of Joints**
Cont'd

14:45 Coffee break

15:00 **Designing against fatigue**
Considering fatigue in different design phases, detail design & material selection. Discussion of some case histories.

15:45 **Final remarks & discussion**

16:00 End of the training course

Registration

Fatigue of Structures

10 - 12 March 2014
European Advanced Training Course
Cologne, Germany

DGM-Membership Number

DGM-member ☐
Non-member ☐

Date of birth

Titel, First Name(s), Name

Phone

Institute / Company

Fax

Department

E-Mail

Street

Post Code / City / Country

Date, Signature