

## 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 and dinner

**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.

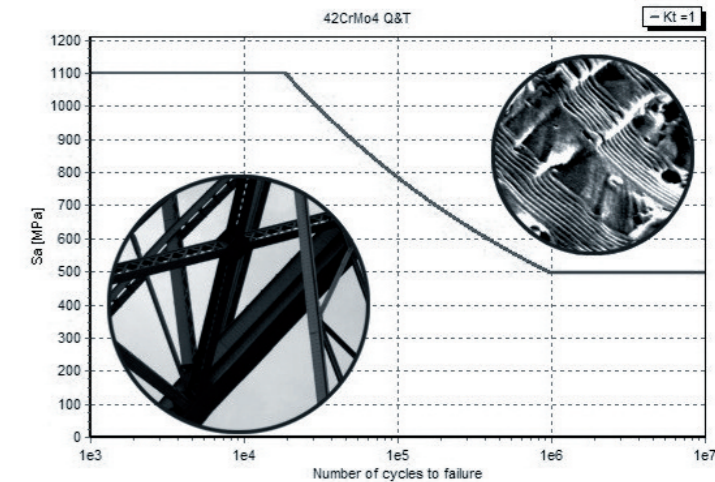
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**NEW****DGM**

European Advanced Training Course

# Fatigue of Structures



# 6-8 March 2013

Cologne, Germany

Fatec Engineering (NL)

INVENTUM GmbH

[www.inventum.de](http://www.inventum.de)

Chairman of the seminar

M.Sc.  
Johannes J. Homan

# Wednesday

- 09:00 **Welcome / Introduction to the course "Fatigue of Structures"**
- 09:15 **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.
- 10:15 Coffee break
- 10:45 **Design and safety concepts**  
Safe life (including infinite life), fail safe and damage tolerance concepts.
- 11:30 **Fatigue properties of materials**  
Fatigue limit, S-N curves, effect of material properties on fatigue strength.
- 12:45 Lunch break
- 13:45 **Low cycle fatigue**  
Fatigue behavior at high loads (macroscopic yielding). Differences with high cycle fatigue.
- 14:15 **Effect of Environment & Corrosion**
- 15:00 Coffee break
- 15:30 **Residual stresses**  
Effect of residual stresses (due to production processes, heat treatment, etc.) on fatigue.
- 16:15 **Effect of surface conditions**  
Effect of surface layer conditions (e.g. roughness) and surface treatments on fatigue.
- 17:00 End of the first day
- 18:30 Dinner

# Thursday

- 09:00 **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
- 18:30 Dinner

# Friday

- 09:00 **Fatigue prediction methods – Damage Tolerance**  
Calculation of inspection intervals using crack growth methods (linear elastic fracture mechanics).
- 09:45 **Scatter in fatigue**  
Scatter in material properties, accuracy of calculations.
- 10:15 Coffee break
- 10:45 **Fretting**  
Fretting corrosion is a process that damages the surface of a structure. The (large) impact of fretting on fatigue will be discussed.
- 11:15 **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.
- 12:45 Lunch break
- 13:45 **Fatigue of Joints**  
Cont'd
- 14:15 **Exercises & case studies**
- 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

6 - 8 March 2013  
European Advanced Training Course  
Cologne, Germany

DGM-Membership Number  DGM-member

Date of birth

Title, First Name(s), Name

Phone

Institute / Company

Fax

Department

E-Mail

Street

Post Code / City / Country

Date, Signature