

3-Days Short Course on

Fatigue Strength of Ship and Offshore Structures

21 PDUs accredited
by the Professional
Engineers Board,
Singapore

★ Speakers ★

Stig Berge

*Professor, Department of Marine Technology
Norwegian University of Science & Technology*

&

Choo Yoo Sang

*Director, Centre for Offshore Research & Engineering
National University of Singapore*



Date: 19 - 21 October, 2004
Time: 9.00 am – 5.00 pm daily
Venue: National University of Singapore

Organized by:

- Professional Activities Centre,
Faculty of Engineering
- Centre for Offshore Research & Engineering



Supported by:

- Keppel Offshore & Marine Ltd



Course Details

This course provides comprehensive and detailed coverage on fatigue strength of risers, ships and offshore structures. The course will be highly useful to engineers, designers and analysts involved in structural design and fatigue assessment. The topics to be covered, with illustrative design examples, are listed below:

- **Basic Concepts of Fatigue Strength**
 - Cyclic Loading
 - Stress- and Strain-based Fatigue
 - S-N Curve, ϵ -N Curve; Fatigue Diagrams
- **Fracture Mechanics**
 - Basic Concepts; Stress Intensity Factor
 - Fatigue Crack Growth
 - Fracture Mechanics Analysis of Fatigue
 - Applications and Limitations
- **Fatigue Limit**
 - Short Cracks; Threshold Effects
 - Factors Affecting Fatigue Strength of Structures
 - Welding, Weld Geometry
 - Yield Strength; Residual Stresses
 - Fabrication Factors; Thickness Effect
- **Variable Amplitude Loading**
 - Load History, Cycle Counting
 - Cumulative Damage, Miner-Palmgren Summation
 - Equivalent Stress Range
 - Weibull Statistics, Closed Form Expressions for Cumulative Damage
- **Fatigue Limit in Cumulative Damage**
 - Haibach Model
- **Environmental Effects**
 - Stress Corrosion Cracking; Corrosion Fatigue
- **Methods for Improving Weld Fatigue Strength**
 - Grinding; Peening; TIG Dressing
 - Other Methods
- **Fatigue Strength of Tubular Joints**
 - Simple and Complex Joints
 - Stress Analysis and Hot Spot Stress Concept
 - Design Criteria; Parametric Formulae
- **Fatigue Strength of Ship Structure Details**
 - Hot Spot Stress Concept
 - Tests and Finite Element Results
- **Fatigue Design**
 - Rules and Recommendations
- **Special Riser Session**
 - Steel Risers - Fatigue Design
 - Titanium Risers - Properties of Titanium, Fabrication Factors, Fatigue Design of Titanium Welds
 - Flexible Risers - Construction, Materials, Failure Modes, Fatigue Design Principles
- **Case studies**

Lecturer's Credentials



Professor Stig Berge is internationally renowned, and is Professor of Marine Structures in The Norwegian University of Science and Technology (NTNU). His fields of research include Fatigue and fracture of structures, Applied fracture mechanics, Experimental strength analysis of structures, structural components, and materials. He served as Chairman of Special Task

Committee on Fatigue Design of Ship Structures (2000 – 2003) for the International Ship and Offshore Structures Congress (ISSC), and is member of American Society for Testing and Materials (ASTM), Com. E8 Fatigue and Fracture Mechanics. Prof Berge has successfully completed many research projects with major funding from the Norwegian Research Council and companies. He established the unique Facility for full scale dynamic testing of flexible risers and umbilicals with combined bending and tensile loading in NTNU. He has completed many projects on flexible risers, including testing and condition monitoring, qualification of titanium for risers and flowlines, corrosion fatigue of armour wire and robust material selection. Prof Berge has conducted testing of full scale sections of a FPSO for assessment of fatigue strength and residual fatigue life. He was also project leader for projects on tubular joints, investigating fatigue capacity, crack growth and fracture mechanics analysis of crack growth in stiffened joints, and residual strength of partially cracked tubular joints.



Assoc. Prof. Choo Yoo Sang is currently with the Department of Civil Engineering and is Director of the Centre for Offshore Research & Engineering in National University of Singapore. He is actively coordinating the R&D collaboration between the industry and academia. Dr Choo's research interests include strength & fatigue capacity of tubular and plated structures, and knowledge-based system

development for applications in the construction and offshore industries. The knowledge-based engineering system (H-LIFT) developed by his research team has been found to be a useful tool for heavy lift planning. His research team has received the Stanley Gray Award in 2001 for the best paper on offshore technology from The Institute of Marine Engineering Science & Technology (UK) and the IES Prestigious Engineering Achievement Award in 2003.

Dr Choo has served in many scientific and technical committees for international society and conferences, and two journals. He received two ISOPE Awards for his significant contributions towards the Society. He served as President of Singapore Structural Steel Society (SSSS) in 1992 to 1994. He is Honorary Fellow of the SSSS and is serving as member of International Institute of Welding Sub-Commission XV-E: Tubular Structure and ISO/TC8/SC8. He has also provided specialist advice to some major offshore projects.

2 Ways to Register!



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ENQUIRIES

Please contact Miss Lilian CHOONG for more information at
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Email: engccl@nus.edu.sg

FEE

Participants from Singapore:- SGD900.00 + SGD45 (GST)
Overseas participants: SGD900.00 (GST Exempted)

DISCOUNT

10% (max.) discount is applicable to:

- Employees of the NUS Technology Associates registered with INTRO (Industry & Technology Relations Office);
- NUS Alumni;
- Organization / Companies sending three or more participants;

REFUND & CANCELLATIONS

A 50% refund will be made for withdrawals (**received in writings**) **ten working days** before the commencement of the course. No refunds will be made thereafter. However, a replacement will be accepted upon prior arrangement at no extra cost. Please inform us of the changes, if any, by fax. **The Professional Activities Centre reserves the right to cancel the course and fully refund the participants, should unforeseen circumstances warrant it.** Every effort will be made to inform participants of any changes.

**Please register me: FATIGUE STRENGTH OF SHIP AND OFFSHORE STRUCTURES
19 – 21 October 2004**

Workshop Fee:

Participants from Singapore: **SGD900.00 + SGD45 (GST)**
Overseas participants: **SGD900.00 (GST Exempted)**

Participant's details

Name: Dr/Mr/Ms: _____ Designation: _____
(Please attached your name card if any)

Name of Organization: _____ Contact Person: _____

Address: _____

Email: _____ Tel No (O): _____ Fax No: _____

NUS Alumni No. (if any): _____

**Dietary Preference: Chinese/Halal/Vegetarian

Payment Mode:

Cheque/Bank draft No: _____ Amount (S\$): _____

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Signature: _____

Payable to "National University of Singapore"

Closing Date: Please send in your registration form together with your payment by **08 October 2004**

Authorized Signature/Company Stamp
