Pressure Vessel and Heat Exchanger Design Course

Venue: IOM3 (Institute of Materials, Mining and Minerals), London  [www.iom3.org](http://www.iom3.org)
Dates: 24-27 April 2017

**COURSE SUBJECT**
The mechanical design of pressure vessels and heat exchangers is addressed, starting from basic principles of DBF (Design by Formulae), but considering also advanced design methods (DBA, i.e. design by analysis). Particular attention is devoted to the comparison between the main calculation codes (as EN 13445, ASME, PD 5500, etc.) in order to show the differences among components with the same design conditions, but calculated with different design codes. Moreover, practical examples from the daily engineering practice are shown.

Participants are trained on how to achieve the optimization of the design, minimizing weight and cost of the equipment, while maintaining compliance with the reference standards. They learn the differences between the various standards in order to be able to recognize which will be the impact of a particular standard in terms of thickness and weight. By attending Sant’Ambrogio design courses participants improve their design capabilities, reducing design times, and gain a better overall view.

**COURSE CONTENTS**

**Module 1 – 24 April 2017**
- General concepts and methods of mechanical design of pressure equipments

**Module 2 – 25 April 2017**
- Mechanical design of pressure vessels under internal and external pressure
- Mechanical design of flanged connections

**Module 3 – 26 April 2017**
- Thermal design of shell and tube heat exchangers
- Mechanical design of shell and tube heat exchangers

**Module 4 – 27 April 2017**
- Designing for loads other than pressure
- Fatigue calculation

**TARGET GROUP**
Pressure vessel and heat exchanger designers working for manufacturers and engineering companies; inspectors of notified bodies who review calculations; personnel charged with quality assurance and offer preparation

**COURSE SPEAKERS**
- Dr.-Ing. Fernando Lidonnici, Convenor of Working Group 53 “Design methods” of CEN TC54 (Unfired Pressure Vessels) and Vice-President of EPERC (European Pressure Equipment Research Council)
- Ing. Sergio Lidonnici, CAE expert and Software Development Engineer

**COURSE VENUE**
This Training Course will be held at the IOM3 Building, 297 Euston Road, London, NW1 3AQ. It is situated within one minute’s walk of Warren Street underground station, with exceptionally easy access to London’s mainline railway stations, and Eurostar.
DETAILED COURSE PROGRAM
Module 1
• General concepts and methods of mechanical design of pressure equipments
  ▪ General principles: pressure equipment design in accordance with ASME and in accordance with PED
  ▪ Material selection
  ▪ Risk analysis: pressure, temperature, risk of overheating, risk connected to the use of quick actuating closures
  ▪ Design methods: DBF, DBA and Design by Experiment
  ▪ Loads and stresses: elements of stress analysis, stress categorization
  ▪ Load conditions
  ▪ Failure modes
  ▪ Stresses
  ▪ Comparison among calculation codes
  ▪ Practical examples of DBA with different methods
  ▪ Experimental tests

Module 2
• Mechanical design of pressure vessels under internal and external pressure
  ▪ Calculation of cylindrical shells, spherical heads, dished heads and cones under internal and external pressure
  ▪ Calculation of opening reinforcements under internal and external pressure
  ▪ Calculation of flat ends
  ▪ Comparison among calculation codes
  ▪ Practical examples of pressure vessel calculation by means of a software tool
• Mechanical design of flanged connections
  ▪ General principles on flanged connection working: bolting up condition, gasket seating, residual pressure on the gasket
  ▪ Criteria for gasket selection: self-energizing gaskets
  ▪ Different types of flanges: welding neck flanges, slip-on flanges, flanges with full-face gaskets
  ▪ Main methods for flange calculation: Taylor-Forge method, DIN method, method provided in CEN norms
  ▪ Comparison among different methods
  ▪ Practical examples of flange calculation by means of a software tool

Module 3
• Thermal design of shell and tube heat exchangers
  ▪ General principles on heat exchanger operation
  ▪ Different types of heat exchangers
  ▪ Fouling factor
  ▪ Single-phase heat exchange: transfer rates and pressure drop
  ▪ Shellside flow: different type of baffles
  ▪ Double-phase heat exchange: condensers and reboilers
  ▪ Termosyphon reboilers
  ▪ Feed water heaters
  ▪ Elements on tube vibration in heat exchangers
  ▪ Practical examples of thermal calculations by means of HTRI software
• Mechanical design of shell and tube heat exchangers
  ▪ High pressure heat exchangers: construction features, comparison among different solutions
  ▪ Tubesheet design
  ▪ Heat exchangers with fixed tubesheet: advantages linked with the use of Annex J of EN 13445
  ▪ Design of expansion bellows
  ▪ Design of floating heads
  ▪ Practical examples of heat exchanger calculation by means of a software tool
Module 4

- **Designing for loads other than pressure**
  - Calculation of towers under wind and seismic loads
  - Calculation of horizontal vessels on saddles
  - Calculation of additional nozzle loads
  - Calculation of vessel supports
  - Practical examples of calculations by means of a software tool

- **Fatigue calculation**
  - General principles on fatigue assessment
  - Simplified calculation in accordance with AD S1 and with Clause 17 of EN 13445-3
  - Detailed calculation starting from stresses in accordance with AD S2 and with Clause 18 of EN 13445-3
  - Fatigue assessment performed by means of F.E.M. calculations – practical examples of fatigue assessment with the simplified method of Clause 17 of EN 13445-3 and of Chapter S1 of AD 2000

**REGISTRATION**

**UK participants** can register at ETD Consulting by filling in the form at the bottom of this page.

For more information please contact:
Dr. Ahmed Shibli
ashibli@etd-consulting.com
+44 1372 363111

**Participants from other countries** can register by filling in the form at the web page below:


For information please contact Mr. Bordoni at bordoni@sant-ambrogio.it (phone number +39 02 70603113)

**COURSE FEES**

The course is modular, so participants can register also for single course modules / days. The registration fees for UK participants are the following:

- for EPERC members and licensees of Sant’Ambrogio software:
  - £350 per module / day + VAT

- for other participants:
  - £450 per module / day + VAT

Payment conditions:
- payment upon registration or at least within 7 days from the beginning of the course

*Participants attending all course modules will be entitled to a 10% discount on the registration fees.*

The registration fees for participants outside the UK are the following:

- for EPERC members and licensees of Sant’Ambrogio software:
  - €400 per module / day

- for other participants:
  - €550 per module / day

*Participants attending all course modules will be entitled to a 10% discount on the registration fees.*
REGISTRATION FORM

Please copy and e-mail / fax / post

This registration form is for UK participants only. Participants from other countries can register by filling in the form on the webpage: http://www.sant-ambrogio.it/en/courses/courses/

For information please contact Mr. Bordoni at bordoni@sant-ambrogio.it (phone number +39 02 70603113)

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Venue: IOM3, 297 Euston Road, London, NW1 3AQ, UK  www.iom3.org

REGISTRATION FEE: All figures are in GB Pounds. All UK attendees must pay 20% VAT.
Please put X below in the box opposite your choice.

<table>
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<th>Course (24-27 April)</th>
<th>For UK EPERC Members and Licensees of Sant’Ambrogio software</th>
<th>For Other UK Participants</th>
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<td>£350 per day + £70 (VAT) = £420</td>
<td>£450 per day + £90 (VAT) = £540</td>
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PAYMENT: Payment can be made by one of the methods below (For payment by bank to bank transfer, pound sterling account details will be supplied on request to: Mrs. Kay Mahoney at: kmahoney@etd-consulting.com) Please quote reference ‘Pressure Vessel Course’ with the payment and state here how you paid/ intend to pay:

By Credit Card: Major cards such as Visa/ Master Card/ JCB/ American Express/ Switch are accepted with the exception of Dinners Club. For security please fax or post this information.

Name of Account Holder
Card Number
Expiry Date
Security Number
Authorization signature
Total amount to pay: £

Accommodation: Course delegates will be provided information on local hotels when they send their registrations through.

Delegate Details: (Required for your badge)
Your title and name:
Position (optional):
Company name & address:
Phone: Fax: E-mail:

Please state below special dietary requirements (if any):

REGISTRATION ADDRESS:

Mrs. Kay Mahoney, European Technology Development, Fountain House, Cleeve Road, Leatherhead, Surrey KT22 7LX, UK kmahoney@etd-consulting.com Tel: + 44 1372 363 111 Fax: + 44 1372 363 222