

## WEBINAR ON PRESSURE VESSEL AND HEAT EXCHANGER DESIGN

**October 20<sup>th</sup> - 29<sup>th</sup> 2021**

The content of this webinar has already been presented many times in Italy in numerous conferences organized in various cities, at least twice a year, starting from 2005. The health situation due to Covid19 has however forced us to transform these conferences into webinars: in 2020 and 2021 we therefore organized, on the same topic, several webinars, for which we registered a much larger participation than in the previous conferences, thanks also to the lower rates that the absence of a logistic organization allows us to practise; after all, the costs are much lower even for the participants, who are able to attend the lessons without leaving their office. We therefore thought, as had been requested by many, to organize a similar webinar also in English, aimed at the designers of pressure vessels and heat exchangers who reside anywhere in the world. The first edition of the English webinar was held in April 2021, also with a large participation of European engineers. Obviously, the difference in the time zone of the participants can be an obstacle: with the time chosen for the first international English webinar, European engineers and those residing in countries with a late timetable compared to CET were obviously favored. However, based on the requests received up to now, this second edition of the English webinar will be held while maintaining the times adopted for the first one.

### PROGRAM

The webinar offers a first introductory day on the general rules of mechanical design and other moments of in-depth study of the most critical aspects of the design of individual equipment, comparing the application of calculation codes with particular reference to **ASME Section VIII division 1 and 2**, the German code **AD 2000** and the **European harmonized standard EN 13445**.

**October 20<sup>th</sup> 2021 - Lesson 1A: GENERAL NOTIONS OF PRESSURE VESSEL DESIGN - 1<sup>st</sup> part**

**October 21<sup>st</sup> 2021 - Lesson 1B: GENERAL NOTIONS OF PRESSURE VESSEL DESIGN - 2<sup>nd</sup> part**

**October 22<sup>nd</sup> 2021 - Lesson 2: MECHANICAL DESIGN FOR INTERNAL AND EXTERNAL PRESSURE**

**October 25<sup>th</sup> 2021 - Lesson 3: MECHANICAL DESIGN OF BOLTED FLANGE CONNECTIONS**

**October 26<sup>th</sup> 2021 - Lesson 4: THERMAL DESIGN OF SHELL & TUBE HEAT EXCHANGERS**

**October 27<sup>th</sup> 2021 - Lesson 5: MECHANICAL DESIGN OF SHELL & TUBE HEAT EXCHANGERS**

**October 28<sup>th</sup> 2021 - Lesson 6: PRESSURE VESSEL DESIGN FOR LOADS OTHER THAN PRESSURE**

**October 29<sup>th</sup> 2021 - Lesson 7: DESIGN FOR CYCLIC LOADS**

**Who should attend the webinar?** The webinar is of particular interest for engineers working for pressure vessel manufacturers, users, engineering companies and inspection bodies. It is aimed not only to designers, but also to people who deal with certification, quality and preparation of offers.

**What is the purpose of the webinar?** The main purpose of the webinar is to make participants understand the most correct design procedures by using the formulae contained in the main international standards, underlining the differences between them and showing, also by means of practical examples, how it is possible to reduce equipment weights and costs while maintaining compliance with the reference standards.

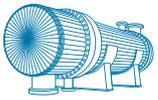
### Participation fees - Price for each lesson (1A+1B is one lesson)

- |  |                   |
|--|-------------------|
| ■ Sant'Ambrogio licensees and <b>EPERC</b> members | 150 Euro + VAT(*) |
| ■ Other participants                               | 200 Euro + VAT(*) |

(\*) VAT is applicable only to Italian companies or individuals

Special conditions are provided for in the case of participation in all modules by the same person or by several people from the same company on the same module.

For information: Sant'Ambrogio Servizi Industriali S.r.l. Dr. Andrea Bordoni  
Tel. +39 02 70603113 | [santambrogio@sant-ambrogio.it](mailto:santambrogio@sant-ambrogio.it) | [bordoni@sant-ambrogio.it](mailto:bordoni@sant-ambrogio.it)



## DETAILED PROGRAM

Note: CET=Central European Time

### Lesson 1 - GENERAL NOTIONS OF PRESSURE VESSEL DESIGN

Wednesday October 20<sup>th</sup> 2021 [9.30-12.30 CET] and Thursday October 21<sup>st</sup> 2021 [9.30 - 12.30] CET

- General principles: design according to ASME and design according to PED
- Material selection
- Risk analysis: pressure, temperature, risk of overheating, risk connected to quick opening closures
- Design procedures: design by formulae (DBF), design by analysis (DBA) and design by experiment (DBE)
- Loads and stresses: hints of stress analysis, stress categorization
- Loading conditions
- Failure modes
- Stresses and strains
- DBF: cross comparison of different design standards
- DBA: general description of the different methods
- Practical examples

### Lesson 2 - MECHANICAL DESIGN FOR INTERNAL AND EXTERNAL PRESSURE

Friday October 22<sup>nd</sup> 2021 [9.30 - 12.30 CET]

- Calculation for internal and external pressure of cylindrical shells, spherical ends, domed ends, conical shells.
- Reinforcement openings
- Flat ends
- Practical examples of Pressure Vessel design using the software

### Lesson 3 - MECHANICAL DESIGN OF BOLTED FLANGE CONNECTIONS

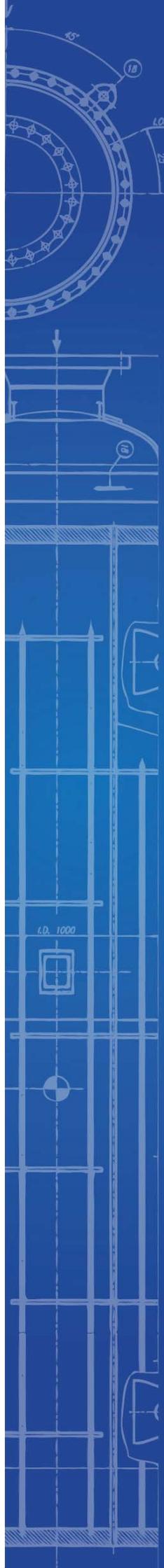
Monday October 25<sup>th</sup> 2021 [9.30 - 12.30 CET]

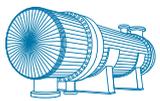
- General principles for the design of a gasketed joint: bolt tightening, gasket seating, residual gasket compression needed to assure leak tightness
- Criteria for gasket selection - hints on self energizing gaskets
- Different flange types: welding neck, slip on, loose, reverse, with full face gasket
- Main methods for flange calculation: Taylor-Forge, DIN, Annex G of EN 13445.3, EN 1591.1
- Cross comparison of the different methods
- Practical examples of flange design using the software

### Lesson 4 - THERMAL DESIGN OF SHELL & TUBE HEAT EXCHANGERS

Tuesday October 26<sup>th</sup> 2021 [9.30 - 12.30 CET]

- Basic principles of thermal design
- Different types of shell&tube heat exchangers
- Thermal exchange in single phase flow: heat transfer coefficients and pressure drops
- Single phase flow in a tube
- Single phase flow across a tube bundle: different types of baffles
- Fouling factors
- Two phase flow: condensers and reboilers
- Thermosiphon reboilers
- Vibrations
- Practical examples of thermal calculations using HTRI<sup>®</sup> software





## **Lesson 5 - MECHANICAL DESIGN OF SHELL & TUBE HEAT EXCHANGERS**

**Wednesday October 27<sup>th</sup> 2021 [9.30 - 12.30 CET]**

- Different heat exchanger types: floating head, U-tube, fixed tubesheet
- Design of tubesheets
- Fixed tubesheet exchangers: Annex J of EN 13445-3
- Design of expansion bellows
- Design of pass partitions
- Practical examples of mechanical design using the software

## **Lesson 6 - PRESSURE VESSEL DESIGN FOR LOADS OTHER THAN PRESSURE**

**Thursday October 28<sup>th</sup> 2021 [9.30 - 12.30 CET]**

- Calculation of tall vertical vessels for wind and seismic loads
- Horizontal vessels on saddle supports
- Nozzle loads
- Pressure vessel supports
- Practical examples using the software

## **Lesson 7 - DESIGN FOR CYCLIC LOADS**

**Friday October 29<sup>th</sup> 2021 [9.30 - 12.30 CET]**

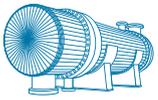
- General principles of fatigue design
- Simplified fatigue assessment according to AD S1 and to Clause 17 of EN 13445.3
- Detailed fatigue assessment according to AD S2, to Clause 18 of EN 13445.3 and ASME Section VIII division 2
- Practical example of a complete fatigue calculation using the simplified method of Clause 17 EN 13445.3

### **Teacher of the webinar: Dr. Fernando Lidonnici**



Dr. Lidonnici boasts more than fifty years of experience in the thermal and mechanical design of pressure vessels and shell and tube heat exchangers. Since 1990 he has been **coordinator of WG53/CEN TC54**, which manages **part 3 (Design and Calculation) of the European standard EN 13445** (Unfired Pressure Vessels). He actively participated in the drafting of the Italian legislation in the sector and in the subsequent development of the same after the entry into force of the Pressure Equipment Directive. He has been an **ASME member** since 1986. From 1994 to 1998 he was a **consultant to the European Commission for the preparation of the PED**. Within the **CTI (Comitato Termotecnico Italiano)** he manages the **Italian "Mirror Group"** which discusses and comments on the draft projects normally developed by TC54. He is the **Italian delegate to the "Pressure Equipment Advisory Nucleus"**, the CEN working group that coordinates the European standards

relating to all products covered by the PED. In December 2018 he received the **Donald Julius Groen Prize** from **IMEche**, the British association of mechanical engineers, for his activity in the field of European standardization. In June 2020 he was appointed **president of EPERC, the European Pressure Equipment Research Council**.



## REGISTRATION FORM - WEBINAR ON PRESSURE VESSEL DESIGN

Company / Association \_\_\_\_\_

Sant'Ambrogio licensee / EPERC member      yes      no

Codice fiscale (\*) \_\_\_\_\_

VAT code (\*\*) \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Postcode \_\_\_\_\_ Country \_\_\_\_\_

Business sector \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

E-mail \_\_\_\_\_ Web site \_\_\_\_\_

Participant: First name \_\_\_\_\_ Surname \_\_\_\_\_

Role in the company \_\_\_\_\_

E-mail participant \_\_\_\_\_

(\*) for Italian participants only    (\*\*) for European participants only

Sant'Ambrogio Servizi Industriali Srl, as data controller, informs you that, pursuant to art. 13 D. lgs. 196/2003 and EU Regulation no. 679/2016, your data will be processed according to the information that can be consulted on the page <https://www.sant-ambrogio.it/en/privacy/> of our web site. The manifestation of your consent is essential for the provision of the requested service.

Finally, Sant'Ambrogio reminds you that you may at any time modify or suspend the provision of the service, as well as exercise all the rights referred to in Article 7 of Legislative Decree 196/2003, by sending an e-mail to the address [santambrogio@sant-ambrogio.it](mailto:santambrogio@sant-ambrogio.it)

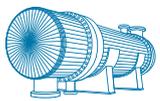
I agree                      I do not agree

The amount of the transfer must correspond to what is indicated on the registration form, including VAT (if applicable). The fees include: teaching material, certificate of participation.

Date \_\_\_\_\_ Signature \_\_\_\_\_

Total amount paid \_\_\_\_\_

For lesson(s)     1     2     3     4    5    6    7



## Terms of payment

Please send the registration form and a copy of the payment by October 15<sup>th</sup> 2021. For organizational reasons, please respect the payment deadlines.

Phone +39 02 70603113 | Fax +39 02 2663546 [santambrogio@sant-ambrogio.it](mailto:santambrogio@sant-ambrogio.it)

The payment of the registration fee must be made exclusively by bank transfer in favor of:

Sant'Ambrogio Servizi Industriali srl - Bank account n° 1386- BANCA INTESA - Via Fabio Filzi 23 - Milano

IBAN: IT900306909612100000001386 BIC: BCITITMM

Reason for Payment: Webinar October 2021 - "First name and Surname participant, lesson(s)"

## Cancellation policy

We require full payment at least 7 days prior to the course date. Cancellations received up to 7 business days prior to class will not be charged the training fee. Registrant substitutions may be made at any time. In the event of a course requiring rescheduling due to instructor illness or unavailability, the cost of the course will be refunded in full, or alternatively rescheduled at a later date. Should you not be able to attend the rescheduled course, a full refund will be provided.

## How to participate

The lessons will take place on Microsoft's TEAMS®. All participants will receive by email the invitation to join the course, together with the instructions and the relevant slides.