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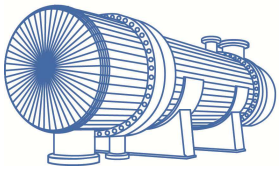
Servizi Industriali Srl - Milano



Piazza Carlo Donegani 8 - 20133 Milano, Italy
tel.:+39.02.70603113 | fax: +39.02.2663546 | santambrogio@sant-ambrogio.it
Partita IVA: 09221480156 | CCIAA: Milano 1279813 | Reg.Trib.Milano 282437/7229/37
**www.sant-ambrogio.it**

# Newsletter - November 2015

## EPERC: the European Pressure Equipment Research Council

**Without pressure equipment** in general, and without pressure vessels in particular, **the modern life in the industrialized countries would not be possible**. In fact this kind of life requires much **greater amounts of energy** than in the past, which can only be generated with the **substantial contribution of pressure equipment**.

Up to the first half of the 19th century, **the only known forms of energy** were **human energy**, **animal's energy** (supplied by horses, donkeys or cattle), **wind energy** (which moved wind mills and sailing ships) and small amounts of energy taken from **water streams moving wooden wheels**: while the heat, which is also energy, could be produced only by burning wood or coal.

Well, do you think that our modern way of living could be possible using these old traditional energy sources? It is clear to everybody that **the life in the 21st century requires much higher quantities of energy and from sources more easily accessible**. Thanks God, today we are able to produce energy and heat with many different and more sophisticated methods: however all of them involve the use of **pressure equipment**. Hydraulic energy requires **pressure pipes to carry the water from basins in the mountains to turbines situated at lower levels**; oil can be converted into **fuels** in **petrochemical plants**, which are made of pressure vessels and pipes, and **fuels are used to generate steam under pressure** in thermal power plants, made of pressure vessels, heat exchangers and steam generators. **Nuclear reactors are also pressure vessels**, where nuclear energy is converted into heat, also used for steam generation; **natural gas** extracted from the soil is **stored and transported into pressure vessels**; big chemical plants, always made of pressure vessels and piping, are also used to produce **fertilizers** for agriculture; **steam under pressure** is used by **different kinds of industries**, such as **food industry, pharmaceutical industry, paper mills, air conditioning, refrigeration**. Wherever you have something **heated by steam**, or **cooled by refrigerant gases**, or operated by **compressed air**, there are **pressure vessels, heat exchangers and piping components**. In many cases also the so called **alternative energies require pressure vessels** (like in the **thermal solar power plants**); and even if we dream of a future made of clean electric vehicles, we must not forget that the **electric energy used to replace LPG, diesel and gasoline will always be generated by hydraulic, thermal, nuclear, solar power plants**, that is in some kind of plants that cannot operate without pressure equipment.

It is a fact that **pressure components are dangerous**: if they are not properly designed, manufactured and tested, and if the materials used in their fabrication have not the required characteristics, the **risk of explosion**, as well as the risk of less catastrophic but always dangerous failures (e.g. **fatigue failures**, **gasket leaks**, etc.) is always present. This is the reason why all the industrialized countries have developed **laws, standards and regulations concerning pressure equipment**, of course with the aim to **minimize the risks**, but always trying to **reduce as much as possible the costs**. So the modern trend in pressure equipment technology is to have always **better and more reliable materials, fabrication procedures, design and testing methods**, while the basic shapes used in the manufacturing industry are practically unchanged: if you compare a drawing of a pressure vessel or a heat exchanger made 40 years ago with a modern drawing made today for a similar piece of equipment, you will probably realize that the differences are really negligible. But if you compare a pressure vessel standard of 40 years ago with a modern pressure vessel standard, you will realize that **the size of a modern standard is 4 or 5 times bigger than the size of the old one**: and the same proportion exists between a calculation report made today and a calculation report of 40 years ago.

This **progressive complication of the standards**, particularly of the standards concerning calculation methods, requires a **continuous effort from the experts** that are working for their preparation and update, who are many times obliged to make **theoretical investigations** on specific subjects with the support of **research activities**. This is the reason why in the most important industrialized countries there are **institutions working for the coordination of these activities**: in U.S.A. there is the **Pressure Vessel Research Council (PVRC)**, in Japan there is the **JPVRC**; in 1995 the **European Commission** has encouraged the foundation of **EPERC, the European Pressure Equipment Research Council**. It would take too much time to tell the story of this institution, that ten years ago counted more than **300 members among individuals and organizations** (manufacturers, research organizations, service providers, users, universities, material manufacturers, notified bodies and trade associations), coming from all European countries: it is enough to say that when the decision was taken to convert EPERC from a "de facto" organization, sponsored initially by the Commission, to a "de jure" organization (**EPERC-AISBL**), that is a legal entity based in Belgium (**association internationale sans bût lucratif = international non-profit association**) supported by the annual fees of its members, something went wrong, the interest in research activities decreased, as well as the number of members; so that in 2011 the proposal was made to disband it.

Unbelievable! How it is possible that in Europe nobody is interested in research on Pressure Equipment? A small group of old engineers (who spent all their professional lives in the area of Pressure Equipment) did not accept this idea, and are now trying to revitalize EPERC. Well, the efforts and the enthusiasm of these people are now beginning to produce some effect: EPERC-AISBL has now **a new operating agent (the British company ETD Consulting)**, a **General Assembly** took place in Gent at the end of March, a **program of activities has been drafted**, new **technical task groups (TTGs)** have been created. This is the information about EPERC that you can get from the web site:

http://www.eperc-aisbl.eu/

***The European Pressure Equipment Research Council is a not-for-profit organisation registered in Brussels.***

***Mission***

*Co-ordinate, develop and promote the common technical interests and strategies of European industry with regard to pressure equipment through research in relation to the international context and European institutions.*

***Aims***

- *Safeguard and represent the technical and economic interests of industries in Europe that rely on pressure equipment.*
- *Facilitate the free trade of pressure equipment and common in-service requirements across borders at international and European level through harmonisation of standards and legislation, acceptance tests and recommended practices.*
- *Promote and encourage collaboration and co-operation through research among the EPERC Stakeholders (Members) with an interest in the manufacture and use of pressure equipment.*

***Objectives***

- *Identify the needs for research and innovation through dedicated Technical Task Groups.*
- *Establish priorities, timescales, scope and funding requirements.*
- *Launch joint research and collaborative programmes and activities based on identified needs.*
- *Support the implementation of the joint projects, collaborative programmes and activities.*
- *Disseminate research results, including through the medium of e-learning, and facilitate the transfer of technology into practice.*
- *Assist and advise authorities involved with legislation, standards and other issues concerning pressure equipment at a European level.*

***EPERC areas of research priorities recently defined by its Members are:***

1. *In-series pressure vessels designed by experiment*
2. *Alternatives to the in-service pressure test*
3. *Ultra-high temperature power plants*

If you now look now at the web site of the European Commission:

https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/index.html

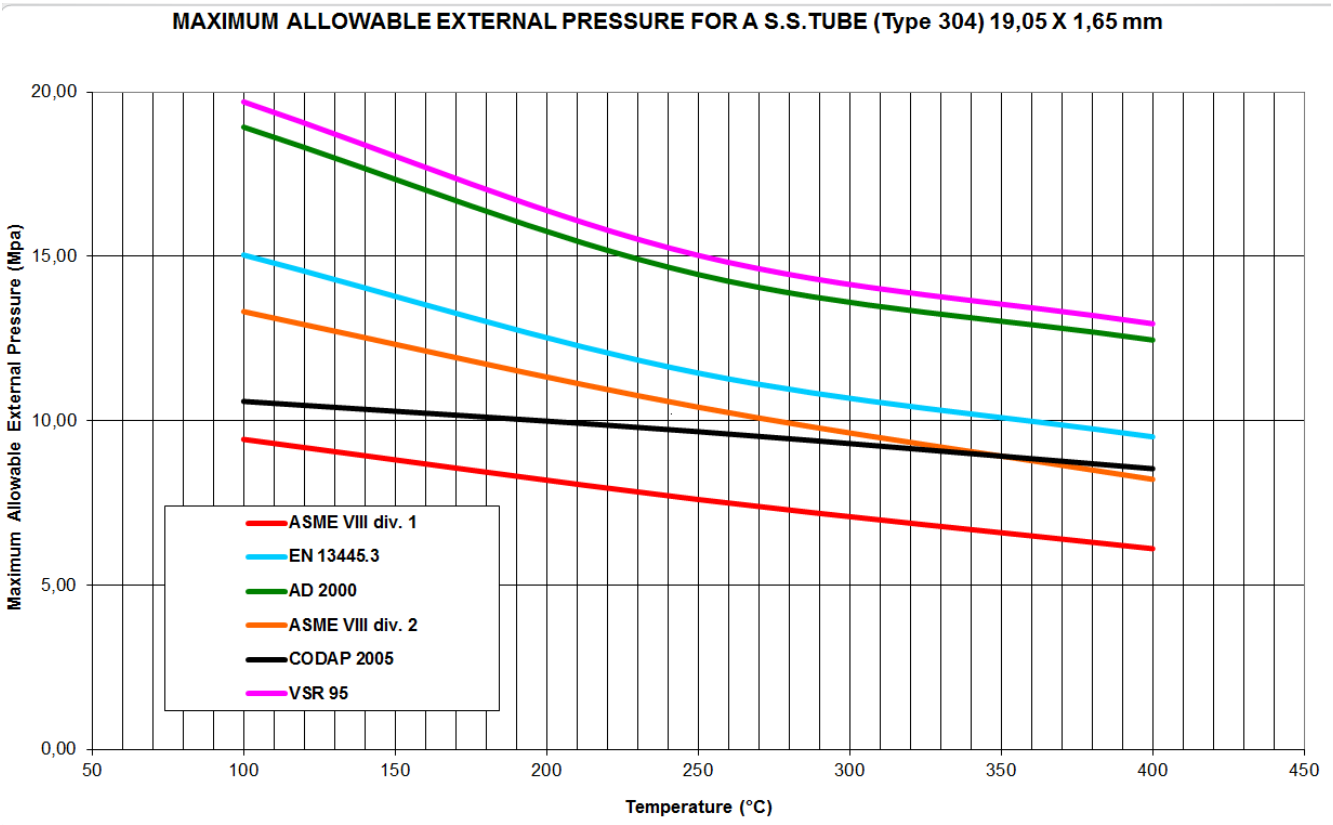
you will realize that **there is a great amount of calls for research activities under the program named "Horizon 2020".** Many of these calls are concerning pressure equipment. The rules of the game are very simple: a group of at least 3 different organizations, coming from different European countries , can submit a research proposal in the context of any one of these calls (see https://ec.europa.eu/research/participants/portal/desktop/en/funding/index.html). But of course, **being members of EPERC-AISBL** and working in one of the existing **TTGs**, or, maybe, founding a new TTG, will give a better opportunity to all interested organizations or individuals.

EPERC is organizing **a new General Assembly in Brussels** (open also to non-members) for the 27th of January 2016. Don't miss this opportunity!

*Dr. Fernando Lidonnici*
*Vice-Chairman of EPERC-AISBL*

**Pressure Vessel and Heat Exchanger Design Course in Düsseldorf – November 18th and 19th 2015.**

In collaboration with **FDBR (the German Association of Pressure Vessels and Boiler Manufacturers)** we are organizing a **2-days training course (in English Language)** on Pressure Vessel and Heat Exchanger Design. In these 2 days we will deal with the first three modules of our standard 4 days (7 modules) training course, that we are repeating in Italy 2 times per year, arrived now at its 19th Edition (the 20th has been already scheduled for the end of November). The content is mainly focused towards **DBF (= Design by Formulae)**, however it is not tied to a specific norm or standard: the **ASME Code**, the harmonized standard **EN 13445**, the German standard **AD 2000**, the British code **PD 5500**, the French Code **CODAP 2005** will be considered, particularly in order to **show the differences** (in many cases not at all negligible) among components with the same design conditions, however calculated with different design codes. Moreover, **practical examples** will be given in order to show the most important design procedures for complicate components, like **flanges**, **heat exchanger tubesheets**, **saddles of horizontal vessels**, in which the **optimization of the geometrical parameters has a strong impact on the price of the vessel**.




In the first day (Modulus n.1) we will deal with the **general design notions**:

- Differences between the American design philosophy and the European philosophy (ASME versus Pressure Equipment Directive)
- Material choice
- Risk analysis: pressure, temperature, risk of overheating, quick actuating closures
- Design methods: DBF, DBA, Design by Experiment
- Loads and stresses: general notions of stress analysis and stress categorization
- Loading conditions
- Failure modes
- Stresses
- Comparison among different PV standards
- Pressure test

In the morning of the second day we will deal with Pressure Vessel design (Modulus 2 – **Mechanical design of Pressure Vessels under internal and external pressure**)

- Calculation under internal and external pressure of cylindrical shells, spherical shells, domed ends, conical shells

- Calculation of opening reinforcement
- Calculation of flat ends
- Comparison among different standards – practical examples using the software

In the afternoon we will deal with the **design of bolted flange connections** (Modulus n. 3)

- General notions about bolted connections: bolting-up, gasket seating, gasket residual compression in service
- Criteria for the choice of gaskets – Notes on self-energizing gaskets
- Different flange types: welding neck, slip-on, flanges with full face gaskets
- Methods for flange calculation: Taylor-Forge, DIN, alternative method in EN13445.3 Annex G
- Comparison among the different flange design methods – Worked examples of flange calculations using the software

The remaining four modules (**thermal design of shell & tube exchangers, mechanical design of shell & tube exchangers, loads other than pressure and fatigue**) are scheduled for February 2016.

In the course also elements of **DBA (= Design by Analysis)** will be given, in order to put the participants under conditions to **correctly assess a FEM analysis** prepared by others.

You will find more details on the **web site of FDBR**:

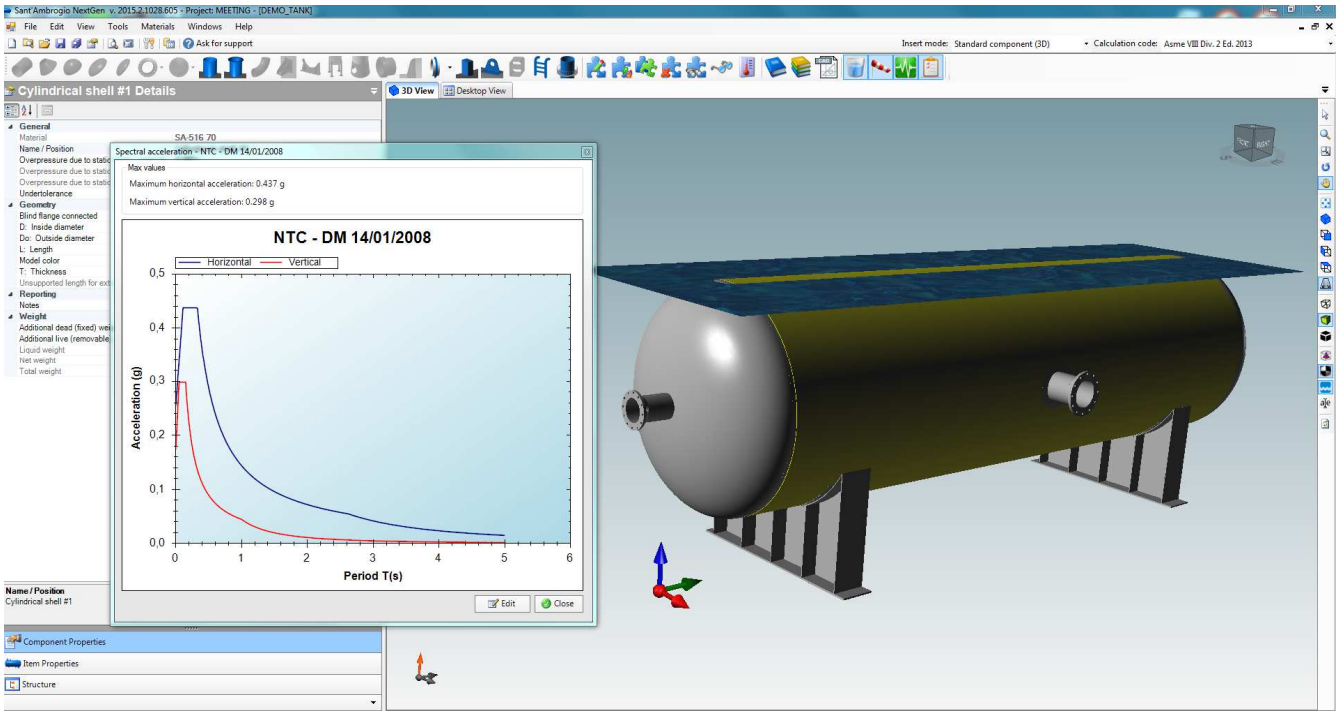
http://www.fdbr.de/index.php?id=157

http://www.fdbr.de/index.php?id=156

or in our web site

http://www.sant-ambrogio.it/en/portfolio/pressure-vessel-design-course-duesseldorf/

## What's being cooked up?




The 2015.2 version of our new software platform **NextGen** (containing the software to **ASME Section VIII division 1, division 2** and **EN 13445.3**) has just been released. It includes the **Edition 2015 of ASME** and many enhancements.

We are currently working to complete the calculation modules according to **EN 13445.3, 2014 Edition;** the package contains now also **wind and seismic calculations**, and particularly the new **Clause 22** of EN 13445.3 (Calculation of **Tall Vertical Vessels**). The user may select **all possible loading conditions** (superposition of pressure, weight, wind and seismic loads during erection, installation, transport, service and test). The general philosophy of this software is to **put the user in the position of performing a complete calculation according not only to the requirements of the selected standard, but also to the requirements of the Pressure Equipment Directive**: therefore we have also tried to **fill all the possible gaps of the standards**, completing the software with calculations taken from different alternative sources. This has been made, for example, for the **saddles of horizontal vessels**, where the traditional Zick's method of ASME Section VIII division 2 has been extended also to wind and seismic calculations (that is, to calculations in presence of **horizontal forces**); or for the **local loads of nozzles**, for which EN 13445.3 considers **only 3 of the 6 possible load components**, and therefore an integration with an alternative method is in many case necessary (the selected alternative method is the WRC 537/297/107 method already used in the ASME calculations).

**We welcome our new licensees:**

**AQUAGAS Sweden** AB – Trosa - **SWEDEN**
**AQUALOGY Aqua Ambiente** – Barcelona - **SPAIN**
**CO.ME.T.** Srl – Roddi (Cuneo) - **ITALY**
**ENDEL** – Colombes – **FRANCE**
**ENGITERM** Srl – Tribiano (Milano) - **ITALY**
**GEMMET TOOL** - Námest na Hané - **CZECH REPUBLIC**
**SOCIETA' ITALIANA del CLORO** Srl – Rosignano Solvay (Livorno) - **ITALY**
**TANKO** SpA - Siracusa- **ITALY**
**TEKFEN Engineering** – Istanbul – **TURKEY**
**TGE MARINE Gas Engineering** GmbH – Bonn - **GERMANY**
**TM.I.P.** Srl – La Spezia - **ITALY**