EPERC Newsletter

European Pressure Equipment Research Council

Number: 5

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Final

Welcome from the Chairman

The first EPERC event take place in INAIL-Roma on April 2019, with a large success: 1st International Conference on "**"Pressure Equipment Innovation and Safety".**

The major objectives of EPERC is to develop and manage R&D to answer different questions, as: innovation, new operating conditions, new materials and new technology to support Codes & Standards development of Pressure Equipment.

The major orientation is to work with the key actors at the European level in one hand, with Industry and in the other hand with CEN Standards Pressure Equipment Technical Committees, all supplemented by International Cooperation (USA, Japan, Korea, China, Russia, India, and many other countries…).

EU "European Union" key actors in this domain include JRC "Joint Research Centre", EIT "European Institute of Innovation & Technology", CEN "European Committee for Standardisation" including all the Pressure Equipment Technical Committees.

All Companies concerned by Pressure Equipment interesting by innovation, to share knowledge and to manage R&D projects, are Welcome in EPERC! Improvements of European Codes & Standards will be EPERC will be involved directly on knowledge transfer, training of users, development of benchmarks and practical case examples on different innovative option of Codes & Standards.

If you have any needs, any initiative, any ideas or any suggestions on "Codes & Standards" or "R&D topics" around Pressure Equipment (PE), please contact us!

EPERC Chairman - Claude Faidy

EPERC Objectives

Identify the needs for research and innovation and make pressure vessel industry safer, innovative and competitive through the exchange of industry experience and dedicated Standard Technical Task Groups; establish priorities, timescales, scope and funding requirements; launch joint research and collaborative programs and activities based on needs identification; support the implementation of the joint projects, collaborative programs and activities; disseminate research results and industry experience, through different medium as 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 the European level.

EPERC proposed tools

The major EPERC activities is attached to:

- **Thematic Task Groups** with a dedicated technical program (charter), form by a group of voluntary active members to express needs and to propose Technical Reports and Define and Manage different R&D programs
- **Regular Thematic Technical Seminars**, 1 to 3 days, open to members and visitors, minimum one every 6 months, to make a status on Gaps, Needs and recent program Results on a dedicated technical topic in order to define R&D needs
- **International Conference**, minimum every 2 years, 3 to 5 days, to exchange at the International level on State of the Art in Pressure Equipment Technology, to promote European Pressure Equipment Industry, to compare existing international Codes & Standards
- **Training courses, master classes, summer school** proposals on different aspects of Pressure Equipment
- **Communication**: major exchanges will be done through EPERC website (a new version is in preparation): **www.eperc-aisbl.eu**

The number of face to face meetings will be limited using in priority phone call conference or web-seminars as alternatives

- **Reports and Documentation**:

All the historical and new EPERC Reports will be downloaded on the website very soon; all other free reports from any member could be also downloaded on the website, after BOD agreement.

EPERC Organization

Board of Directors (BOD)	Communication, Documentation and website
Members	
Thematic Task Group (TG) 1 to 10… with a TG Chairman in charge of TG management, a group of members, a charter and a list of potential R&D projects	
Periodic Thematic Seminars : around existing active TG or New Topics, to develop State of the Art achievement and discuss potential needs for new programs	
International EPERC Conference on present and future Pressure Equipment Technical Activities status and associated needs to support: **Safe, Competitive and Innovative Pressure Equipment and Renewable Industries**	

EPERC Task groups running or close to open

Fatigue: in connection with EN13445 for Vessel first, and later with EN13480 for Piping systems; what's the detail background of existing rules, how to compare them with other Codes (non-nuclear and nuclear), how to consider different environments in fatigue analyses, what's the level of margins and conservatisms attached to different rules, what kind of complementary R&D is needed, as all type of weld join fatigue reduction factors or how to consider plasticity and cyclic nonlinear material constitutive equations (in connection with EPERC TG on Nonlinear Design Rules)…

Non Destructive Testing as alternative to hydro proof tests: after analyses of a large questionnaire reviewing the different practices at the EU level, some practical proposals will be done for operating plants alternatives

In series produced pressure equipment: many specific aspects to the "series" aspects will be analyzed for practical proposals

Bolted Flange: (new task group will start soon) starting by an example of innovative bolted flange (lightweight, leak tightness assure by metallic seal, large case by case experience in many different industry..), and move to leak tightness criteria, gasket properties and design rules for EN 13445, EN13480, EN1591… in accordance with corresponding CEN TC 74, 54 & 267. Potential new topic: "fugitive emission"

Nonlinear Design Rules: (new task group will start soon) development of limit load and elastic-plastic analyses rules for monotonic loads (plastic collapse, plastic instability, fatigue plasticity amplification factor, local failure and rupture analysis) and cyclic loads (plastic shakedown and fatigue). 2 methods are proposed with material properties, criteria and margins: limit load analysis and direct elastic-plastic analyses

Many new partners have join us recently with 2 major improvements:

- slight enlargement of the scope to nonlinear fracture mechanic and bolted flange nonlinear analysis
- a dedicated experimental program to support different methods and material constitutive equations is under definition and will be launched soon

Additive Manufacturing: new task group will start very soon to define how to use this technology for Pressure Equipment in connection with EN corresponding testing

Nuclear-Non nuclear bridge: new task group will be defined soon with 2 major objectives:

- how to consider seismic event for non-nuclear plants
- how to use non-nuclear pressure equipment Codes & Standards for Safety application as valves, pumps and heat exchangers

The corresponding deliverables of each Task Group will be: different International Code comparisons, review background of existing rules and proposal to improve these rules with CEN TC's, gaps and needs identification for new innovative use, recommended practices associated to R&D programs and Standards Code Cases proposals in accordance with EN PE Technical Committee.

EPERC Potential other Task Groups

(Generally in connection with corresponding CEN Pressure Equipment Technical Committee)

- **EN13445 Background**: Updated version for Vessel design rules in connection with TC 54
- **Piping design rules** in connection with TC 267 in order to enlarge the scope for innovation and renewable energy applications; for example piping system design rules under high level dynamic loads and strain criteria…
- **Hydrogen PE** and specific aspects of interaction of the pressure boundary with hydrogen
- **High pressure PE**: pressure greater than 500 bar (50 MPa) and consequences on design, construction or operation of these PE
- **High temperature PE**: temperature greater than 450 °C and consequences on design, construction or operation of these PE due to creep and interaction with other damages as fatigue, plastic shakedown or buckling
- **Cryogenic PE**: temperature less than 0 °C and consequences on design, material and construction or operation of these PE
- **Fitness for service rules and Risk based Inspection,** including rules to define remaining life of PE in front of all the potential degradation material
- **New NDE Techniques** and associated requirements in accordance with to-day State of the Art, including potential use of drone and robot to perform ISI
- **New fabrication process** and associated requirements in accordance with to-day State of the Art, including Additive Manufacturing

- **Non-metallic PE**: started by High Density Polyethylene Pipe to develop a dedicated appendix to EN 13480 (in connection with TC 267 & 155) for design, material, fabrication, installation, tests and operation guidelines
- **Non-steel PE**: aluminum, copper, titanium… to be defined with end users, and material and manufacturer companies of corresponding PE
- **Fitness for Service and Risk Based Decision making**: toward a European Procedure consistent with existing Procedures, like RIMAP, API, ENIQ, ASME-RIM… including **Defect evaluation rules,** as cracks, thinning areas, leak before break…
- **New materials** for new innovative PE application, as high pressure, high temperature, non-metallic materials…
- **New welding techniques:** Heat Treatment and Repair technology for PE in operation, for Construction and Repair Technology as Excavation or different Repair constraints, in accordance with to-day State of the Art
- **Specific needs for high safety application** on design, manufacturing and operation of PE, as Nuclear, Aeronautic, Space, Car, Petro-chemistry, Rail, Medical or other specific industries**,** as Leak Before Break or Incredibility Of Failure or Reliability approach of Pressure Systems for Design, Manufacture and Operation…

Any actors or interesting parties are welcome for any exchanges with EPERC, or any topic to consider: **please express your needs, your comments, your suggestions and contact us through EPERC email addresses attached.**

EPERC Recent Events

✓ 1st EPERC International Conference

- **Title**: "Innovation and Safety of PE"
- General topics covered:
  - Innovation – Competitiveness- Renewable
  - Codes & Standards, Design and Fabrication, High Temperature, Non-Destructive Examination and In Service Inspection in Operation, Fitness for Service and Risk based inspection, Degradation mechanisms, Additive Manufacturing, Drones & Robots for Inspection…
  - EPERC and SNETP (Suitable Nuclear Energy Technical Platform)
- **Conference Chairman:** Andrea Tonti – INAIL
- **Location**: INAIL, Roma, Italy
- **Date:** April 1-3, 2019
- Large participation, more than 100 international participants: 80 from Europe and 20 from outside
- More than 60 presentations
- Final Program and Abstracts of presentation are available on EPERC website
- Papers are collected with copyright and Conference Proceedings will be available in the next 2 weeks
- Next Conference will probably take place in 2021
- **In 2020, a general EPERC Workshop** will be organized with active and potential EPERC Task Groups and CEN Technical Committees on Pressure Equipment.
- **Questionnaire** to express participant interests (based on around 20 answers) leads to a synthesis ranking of priorities:

PV Rules / Creep	10
Fatigue / Creep fatigue	8
Bolted flange and sealing	7
Non Linear Rules	7
FFS / RBI	6
Piping Rules	5
Alt. To Pressure Test	5
Hydrogene	3
In serie	2
New Mat	2
Nuclear-Non nuclear Bridge	2
Seismic Risk/Design	2
High Pressure	1
Safety device	1
Welding	1
General Code Comparison	1
New NDE	1

All corresponding information will be download on EPERC website very soon.

✓ 1st meetings with Industry

3 task groups were launched after these meetings with important interest of industry, and 3 EPERC preliminary Chairmen has been proposed.

For registration to the group or for more information or suggestion send an email to the EPERC preliminary Chairman and the EPERC Operating Agent

- nonlinear design rules (Claude FAIDY)
  claude.faidy@gmail.com
  Bart.Teerlinck@sirris.be
- additive manufacturing (Andrea TONTI)
  a.tonti@inail.it
  Bart.Teerlinck@sirris.be
- fitness for service (Claude FAIDY)
  claude.faidy@gmail.com
  Bart.Teerlinck@sirris.be

✓ EPERC at ASME - PVP 2019 in San Antonio

- presentation at ASME Pressure Vessel and Piping conference last July in San Antonio
- 2 papers were presented, with a large interest of the audience and many questions to join us:
  - General EPERC presentation: PVP19-93859

  - EN 13445 Fatigue Rules Improvements (partially done by EPERC members) PVP19-93910
- Along this Conference many EPERC topics are covered, like: Additive Manufacturing, Fatigue, Bolted flange and Sealing, Hydrogen, Creep, Ratcheting, Codes and Standards status and on-going development…
- The program of the PVP Conference and the EPERC presentation will be download soon on EPERC website

EPERC Future Activities

- New version of the website (on-going action)
- Meeting Preparation of CEN Technical Committees on Pressure Equipment and EPERC – Brussels before end of 2019
- Assure success of the 2 running TG's and the 3 new one with dedicated charters; be prepare to launch other TGs like "Bolted Flange and Sealing" or "Hydrogen"…
- Organize shortly Seminars on "Status, Gaps and Needs" for the 3 new EPERC TG's
- Continue to develop EPERC new members and international cooperation
- Develop a dedicated action toward "Universities"
- EPERC participation to UIA (Union of International Associations): 13th Round Table Europe on November 4, 2019 in Brussels

EPERC Board of Directors responsibilities

- develop a large group of interesting EPERC members or potential members from EU countries and international cooperation with other countries
- be in touch with corresponding CEN Technical Committees
- prepare a "chart" for the each task groups
- organize shortly an EPERC Seminar and prepare a report on "State of the Art, Gaps and Needs, Code & Standards status, including comparison with international Codes"
- define a location for the Seminars close to an involved EPERC member or close to a CEN Technical Committee meeting
- **all location proposal by any interesting parties are welcome and will be considered by EPERC BOD**……
- start to define an R&D road map with some project definition in order to have some proposal for EU budget requests for support
- develop regular update information on EPERC website on Task Groups and Seminars

If you have any needs, any initiatives, any ideas or any suggestions on "Codes & Standards" or "R&D topics" around Innovation on Pressure Equipment (PE)

Welcome and please Contact us!

How to contact us?

EPERC Website: **www.eperc-aisbl.eu**

Mail address: EPERC-aisbl, Blue Point Brussels
Boulevard A. Reyers 80, 1030 Brussels

EPERC Operating Agent: Bart TEERLINCK
e-mails: info@eperc-aisbl.eu
Bart.Teerlinck@sirris.be
Phone: +32 498 91 93 94

EPERC Chairman: Claude FAIDY