EPERC
European Pressure Equipment Research Council

EPERC Newsletter

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Now, it's time to start working!

At the beginning of this year, just before the start of the lock-down period, a **joint meeting of many EPERC Task Groups was held in Milano**. The meeting was the proof that an exchange of opinions among the European Pressure Equipment experts is absolutely necessary in several topics for which theory or methods are not yet sufficiently clear and therefore ready for the preparation of a CEN standard: among them, **Fatigue, Alternatives to Pressure Testing, Non Linear Analysis, Fitness for Service, Creep Design, Bolted Flange Connections, Recertification of existing pressure Equipment, Additive Manufacturing**.

The reports of these meetings are freely available on our **web site** www.eperc-aisbl.eu: in the same web site we have mentioned the names of the convenors (or candidate convenors) of all Task Groups, with the invitation to all interested people to contact them in order to organize further meetings. In the reserved part of the same web site we have placed all **the most important reports presented during the Milano meetings and during the Rome conference of last year**, so that all the EPERC members could have an idea of the work in course and make reasonable proposals for further developments. However, just after the end of the Milano meetings, the Covid 19 started to spread all over the world, thus causing in Europe the need of the so called lock down, with the **general stop of any kind of physical meeting**: for this reason it is very hard to imagine the repetition of events like the Rome conference or like the Milano TG meetings.

On the other end, we have to note that the sanitary emergency caused by the Covid 19 has also had some positive effect: the Pressure Equipment industry has not in fact suffered any stoppages or any noticeable slowdown in work, thanks to the many software programs used to run **virtual meetings**, thus making possible contacts among people located in different countries and cities, all sitting in front of their PCs, where it is now possible to show any kind of technical documents. At the end, this is also **a suggestion for all the TG experts**: a virtual meeting made with GotoMeeting, with Zoom or with Teams has certainly a lower cost for the participants: no travel or hotel costs, no time spent for displacements to different countries.

May be somebody could regret the lack of the possibility to offer a coffee break to the participants, but the system works, and it is now largely used in the technical offices of manufacturers, users, inspection bodies and engineering companies.

In June **we have also organized our yearly General Assembly as a virtual meeting**, and the results have been absolutely positive.

Of course to keep the web site up to date, to supply on it all possible information on the rules, on the development of the standards, on the events concerning Pressure Equipment industry has a cost, which can be now covered only by the association fees of the EPERC members, since the organization of physical conferences like the one we held in Rome last year will not be possible, at least for some more months: that is the reason why we can rely only on the financial support of our members to run the association, and that is the reason why the access to the TG meetings is reserved to EPERC members.

On the other end our association fees have been kept at a reasonable level, particularly for individuals. However I wish to invite all the interested people, even if they are not yet members, to contact us to get more information on the activity of the EPERC TGs: any needs, any initiative, any ideas or any suggestions on the existing TGs or on the establishment of new TGs on different topics concerning Pressure equipment are welcome!

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EPERC Task groups running or recently open

TG1 Fatigue (Convenor Guy Baylac):

- Objectives: no cracks or no leaks associated to all potential cyclic loads
- Overview and comparison of existing international Codes and Standards
- Gaps and needs identification, in particular for innovative PE with particular operating condition, as environment, pressure, temperature…
- Material properties: fatigue curves (standards, mean and design, low cycle and high cycle, environment, surface finish, mean stress, cold work, stress or strain control tests…); cyclic stress-strain curves; data for use of new material…
- Analysis engineering methods: Equivalent stress (Tresca/ Von Mises/ Rankine…), Cycle combination and counting; principal stress turning along a transient; Plasticity consideration (K_e, K_n, K_v …)
- Specific cases: stress concentration, welds, bolts, crack like defects, bellows…
- Piping systems and support
- Revised existing "Fatigue Rules" with recommended practices in European Standards

TG2 Non Destructive Testing as alternative to hydrotests (Convenor Crescenzo Di Fratta):

- Objectives: operation alternative to pressure test in Europe
- Regulation background in Europe
- Analysis of NDT techniques
- In-service Inspection Guidelines and Best Practices for "normal" and "special" PE
- Introduction of recommended practice in European Standard

TG3 Bolted Flange (Coordinator: Claude Faidy):

- Objectives: bolted flange and sealing design rules with leak tightness for Boilers, Vessels and Piping systems, including innovation and fugitive emission
- Overview and comparison of existing international Codes and Standards
- Gaps and needs identification, in particular for innovative PE bolting flange with particular operating condition, as environment, pressure, temperature…
- Non-metallic and metallic sealing comparison
- R&D leak tightness test program and seal design analysis
- Specific case of compact flange and piping clamp
- Revised existing "Bolted Flange Rules" with recommended practices in European Standards

TG4 Nonlinear Design Rules (Convenor: Claude Faidy):

- Objectives: material nonlinear analysis for design of Pressure Equipment or Part of PE; to evaluate margins and analyze some PE
- Revision of existing Codes & Standards comparison with Gaps and Needs definition
- Analysis of Failure Modes: plastic collapse, plastic instability, local failure, buckling, creep…
- Analysis of Degradation Mechanisms: Fatigue, Ratcheting, Creep-fatigue…
- Flaw Tolerance Analysis, including Leak Before Break and Master Curve Approach
- Specific cases, as: reinforcement rules, elastic follow-up, sealing, cyclic dynamic loads…
- Base materials and Welds material properties: stress-strain curve for monotonic loads, cyclic constitutive equation for cyclic loads (fatigue and ratcheting) for all the PE materials used in European Standards; Thermal Ageing and Environmental degradations
- Revised existing "Nonlinear Design Rules" with recommended practices in European Standards

TG7 Fitness for Service and Risk Based Decision making (Convenor: Claude Faidy):

- Objectives: support to PED Risk Analysis and Instruction notice requirement, Ageing management and surveillance of PE in operation, acceptable degradation and repair-replacement criteria proposal
- Overview and comparison of existing international standards with Gaps and Needs definition
- Fracture mechanic methods: K handbook, J and C* estimation scheme, stress-strain curves and toughness properties (brittle, ductile, transition with thermal ageing consideration…
- Fatigue/Creep crack growth methods, including multi-defect interaction, crack growth rate of major PE material, R ratio correction, threshold, plasticity, combine cycles, small cracks, environmental… Pre-analyze defect propagation curves…
- Critical crack size under monotonic and cyclic loads, no-creep and creep conditions
- Leak Before Break
- Thinning rate and acceptable criteria
- Recommended practices report
- Benchmarks and Practical case examples
- Introduction of recommended practice in European Standards

TG12 Pressure Equipment re-certification (Convenor AndreaTonti):

- Objectives: Boilers, Vessels and Piping PED requirement fulfillment and original design with past National Codes & Standards
- Identification of major differences between international Codes used and new PED requirements: conformity assessment, ageing of material, embrittlement of part of PE, sigma phase precipitate, high temperature embrittlement, NDE

performance and results, welding procedure qualification, welders qualification, Pressure tests, Overpressure protection….
- Recommended practice report for operating plants
- Introduction of recommended practice in European Standard

EPERC TG5 program on "**Additive Manufacturing**", TG6 on "**Creep design rules**" and TG11-13 on "**Hydrogen PE**" will be defined and released soon on EPERC website

EPERC Potential other Task Groups

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

TG8 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

TG9 EN13445 Background: Updated version for background of Vessel design rules in connection with TC 54.

TG10 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.

TG11-1 Hydrogen PE and specific aspects of interaction of the pressure boundary with hydrogen

TG 11-2 High pressure PE: specific rules for pressure greater than 500 bar (50 MPa) and consequences on design, construction or operation of these PE.

TG13 Cryogenic Pressure Equipment for temperature less than 0 °C and consequences on design, material and construction or operation of these PE.

TG14 New Materials /Non Steel Materials
- for new innovative PE application, as high pressure, high temperature…
- aluminum, copper, titanium, nickel… to be defined with end users, and material and manufacturer companies of corresponding PE.

TG15 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

TG16 New Welding Procedures
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.

TG17 HDPE Piping Rules
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.

TG18 In-series Pressure Equipment
Particular needs of design, fabrication, inspection when the production of PE is associated to a large series.

TG19 Ultra Super-critical Power Plants
From the smallest, most compact USC technologies to the most Advanced Ultra-Super-Critical (AUSC) technologies available, companies have efficient solutions for steam power plant—all supported with the latest digital capabilities to deliver better performance, greater efficiencies and improved reliability, all at a lower cost.

TG20 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, high reliability component, with associated specific requirements for Manufacture, Operation and Ageing Management.

As you can easily see, there are various topics concerning Pressure Equipment for which suitable technical solutions have not yet been found, and for which discussions among the experts are therefore needed. Please check carefully which one of these topics is important for your professional career: pay attention to the costs that new ideas and new rules could reduce, get in contact with your colleagues and evaluate the possibility of joining EPERC, either as a company or at least as individuals. All the BOD members are ready to answer your questions and to clarify your doubts. Note also that any other TG can be proposed to EPERC BOD by any group of volunteers.