

Task Group 7 – FFS & RBI

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Minutes of the 3rd TG7 web-meeting

Wednesday May 25, 2022 - 14:00 – 17:00 (Paris Time)

1 Chairman Welcome of Participants

TG 7-3rd meeting - 25.05.2022				
PARTICIPANT	E-mail address	Member	Country	Present
Marek Adamczik	marek.adamczyk@famet.com.pl	NO	Poland	Partially *
Anne Chaudouet	anne.chaudouet@gmail.com	NO	France	YES
Corrado Delle Site	c.dellesite@inail.it	YES	Italy	YES
Philippe Rohart	philippe.rohart@cetim.fr	NO	France	YES
Jader Furtado	jader.furtado@airliquide.com	YES	France	YES
Yin Jin Jamin	yin.jin.janin@twi.co.uk	NO	UK	YES
Karl-Fredrik Nilsson	karl-fredrik.nilsson@ec.europa.eu	NO	Nederland	YES
Massimiliano Grassi	grassi@sant-ambrogio.it	YES	Italy	YES
Fernando Lidonnici	fernando.lidonnici@fastwebnet.it	YES-BOD**	Italy	YES
Guy Baylac	guy.baylac114@gmail.com	YES-BOD**	France	YES
Andrea Tonti	a.tonti@inail.it	YES-BOD**	Italy	YES
Claude Faidy	claude.faidy@gmail.com	YES-BOD**	France	YES
* Attend 20 minutes, no possible communication				
** BOD: EPERC Board Of Directors				

2 Chairman General EPERC TG7 Introduction

2.1 Remarks on previous meeting

- No Urgent remarks
- Participants can send an email (with EPERC in the Title), if you have a particular remark

2.2 Remember EPERC Strategic Plan

- Comparison of International Codes & Standards
- Identification of Gaps & Needs with Code Organization and Industry
- Developments of R&D programs associated to dedicated Road Map developed by topics at the TG level
- Development of Recommended Practices with all the rules/data validation
- Performance of Benchmarks on practical cases
- Code Case Proposal
- Knowledge transfer through: Regular Thematic Technical Seminars, International Conference, Training courses, Master Classes, Summer School, Reports and Documentation
- Communication and Registration to different EPERC Activities through: www.eperc-aisbl.eu

2.3 Overview of the EPERC TG7 Road Map by TG07 Chairman

- WP1 : International Codes comparison

All the TG members has to confirm the TG7 selection by email to the TG7 chairman

The TG members will collect first the "Table of Content" of the last Editions of each International Code to consider and send it by email to the TG7 chairman:

- for FFS :
 - ✓ ASME/API : API 579/ASME FFS, ASME BPVC Section XI Appendices and Code Cases
 - ✓ AFCEN: RSEM (App. 5) / RCC-MRx (App. 16)
 - ✓ SNCT: CT Maintenance ESP
 - ✓ BSI: R5-R6, BS 7910
 - ✓ EC: FITNET, SINTAP
 - ✓ AIEA: VERLIFE
 - ✓ Others: JSME, KEPIC, ASME ST LLC ...
- for RBI
 - ✓ ASME BPVC Sect XI Code Cases/Division 2 RIM
 - ✓ API 581,
 - ✓ EC: EN16991, RIMAP, ENIQ,
 - ✓ TWI TWI Procedure,
 - ✓ Others: JSME, KEPIC, ASME ST LLC ...
- WP2 : Major Degradation Mechanism to consider
 - WP 2-1: List of Degradation mechanism considered in existing Codes & Standards
 - WP 2-2: Gaps and needs from the Code review, the on-going R&D and the innovative industry needs
 - WP 2-3: More URGENT needs of Industry
 - WP 2-4: Preliminary Recommended Practices based on existing knowledge and Codes & Standards review and comparison
- WP3 : Complementary FFS Research Program

To-day preliminary list of synthetic topic for review and Research programs to perform:

- Cracks:
 - ✓ crack initiation, crack growth and fracture: different procedures, material properties and criteria
 - ✓ development of an "EPERC Handbook" on K – J and C* evaluation
- Fatigue analysis and environment effects (up to crack initiation)
- Thinning- Pitting: local / general
- Damages in Hydrogen environments
- Overloads and buckling, vacuum collapse
- Loss of material properties: thermal ageing, strain ageing...
- Wind / Tornados effects
- Consequences of Dents and Gouges / Lamination
- Fire
- Others...

For each of them a dedicated report will be prepared with:

- Definition and Scope
- Existing Analysis methods and criteria
- Other particular approaches and criteria
- Associated Material Properties needed
- Methods and Material data validations: theoretical, experimental, standards...

Potential other topics and syntheses:

- WP4 : Local Approach of Rupture
- WP5 : Complementary RBI Research Program
- WP6 : Benchmarks
- WP7 : Final Recommended Practices
- WP8 : Synthesis and Code Cases Proposals
- WP9 : Knowledge Transfer

3 Selected High-Priority Topics

- WP1 : International Codes comparison
- WP2 : Major Degradation Mechanism to consider
- WP3 : Complementary FFS Research Program

4 General Discussion and final remarks

2 types of activities are discussed:

- Status of International Codes and Standards
- How to contribute to existing and future R&D programs

One topic seems to be extremely important to the TG7 members:

- Hydrogen technology
- Consequences of hydrogen on existing damage analyses rules, like fatigue or creep...
- How to be an EC actor on this domain
- Good understanding of the major phenomenon associated to different conditions of hydrogen environment
- A bibliographic review will be appreciated by TG7 members
- List of organizations to be in touch with (Jader Furtado proposal):
 - [ESIS - European Structural Integrity Society](#) (Italy)
 - [IOM3 - Institute of Materials, Minerals & Mining](#) (UK)
 - [TMS - The Minerals, Metals & Materials Society](#) (USA)
 - [SF2M - Société Française de Métallurgie et de Matériaux](#) (France)
 - [MTI - The Materials Technology Institute](#) (USA)
- other possible organization, better if any TG7 members are able to add also a name with an e-mail address, please send your proposal to TG7 Chairman by email...
- Last proposal to identify gaps and needs for Hydrogen Environment (from Jader Furtado):

Damage mode	Material class (Metal, Ceramic, Polymer...)	Component type (piping, flange, pressure vessel)	Function (What it does?)	Load type (static, cyclic, residual)	Environment	Industry	Code & Standards	Gaps found in Codes & Standards	Gaps found in R&D
SRC (stress relaxation cracking)									
CUI (corrosion under insulation)									
HE (hydrogen embrittlement)									
fatigue							EN 13445, ASME P1VC VIII, I, II, III, BS 7910, AFCCEN-RCC-MR, R5 & R6, API 579 - ASME-FFS-I, ASTM E647, ...		
fracture							EN 13445, ASME P1VC VIII, I, II, III, BS 7910, AFCCEN-RCC-MR, R5 & R6, API 579 - ASME-FFS-I, ...		
creep							EN 13445, ASME P1VC VIII, I, II, III, BS 7910, AFCCEN-RCC-MR, R5 & R6, API 579 - ASME-FFS-I, ...		
HTHA (high temperature hydrogen attack)							API 941		
HT corrosion (oxidation,									

5 EPERC TG7 Seminar and Conferences

5.1 Potential EPERC web-seminar on FFS and RBI

- Title: "Fitness for Service and Risk Based Inspection of Pressure Equipment"
- 3-days web-seminar: FFS of PE
- Date to be defined very soon: between October 15th and November 15th
- Proposition de program by TG7
 - At BOD level on June 10, 9:30 to 11:30
 - At EPERC General Assembly on June 28
- Call for presentations
 - Presentation summary for September 15
 - Copy of the slide to prepare a Proceeding
- Cost: proposal at next General Assembly by EPERC Chairman
- Opening of dedicated page concerning the Seminar: EPERC Chairman

5.2 Potential EPERC Conference: next year

- Announcement at EPERC General Assembly on June 28
- Opening of dedicated page concerning the Conference: EPERC Chairman

5.3 Other interesting conference

Conference "Steel & Hydrogen" to be held in Gent, Belgium this year, focused on the following topics:

- Hydrogen embrittlement: effect of hydrogen on mechanical properties
 1. Aqueous environment
 2. Gas environment
 3. HIC & Stress Sulphide Cracking (SSC)
 4. Metallurgical influences
 5. Mitigation actions (microstructural design, coatings, etc.)
 6. Mechanisms
- Modelling the hydrogen-metal interactions and/or the hydrogen embrittlement from atomic to meso-scale
- Advanced methods to characterise hydrogen
- Hydrogen-metal interactions: hydrogen activity, diffusion, trapping, etc.
- Surfaces and coatings for metallic substrates in hydrogen environment
- Industrial hydrogen challenges
- Future material challenges for hydrogen applications
- Other

6 TG7 Action List before next meeting

1. List of Codes & Standards to be compared, last edition table of content
2. List of degradation mechanisms to be considered
3. List of environment to consider: water, steam, hydrogen, oil & gas, chemical industries, others...
4. First "gaps and needs"
5. More urgent needs from industry
6. Bibliographic review on Hydrogen Technology and Potential Degradation
7. Preparation of TG7 Seminar
8. Contribution to EPERC Conference preparation

7 Conclusions

- Interesting meeting in front a "**very large scope** of technical topics"...
- Any participant can send an email to the TG7 Chairman (with EPERC in the Title), in order to ask a question, propose remarks or suggestions, present a practical case to the TG7 Chairman, propose some new potential members and to registered new European EPERC members
- **NEXT TG7 meeting:** date to be advised depending on the availability of new documents.
