

## Task Group – Fitness for Service & Risk Based Inspection

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Final Agenda of the third Teams<sup>®</sup> meeting of TG7

**Wednesday May 25, 2022**

14:00 -17:00 CET

### 1 Welcome of the participants

### 2 Remarks on previous meeting minutes

### 3 Remember EPERC Strategic Plan

- Comparison of International Codes & Standards
- Identification of Gaps & Needs with Code Organization and Industry
- Developments of complementary R&D programs associated to dedicated Road Map developed by topics at the TG level
- Development of Recommended Practices with all the rules validation (methods and material properties)
- 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](http://www.eperc-aisbl.eu)

### 4 Overview of the EPERC TG7 Road Map

#### 4.1 WP1 : International Codes comparison

WP3-1 : List of Degradation Mechanisms

#### 4.2 WP2 : Major Degradation Mechanisms to consider

WP3-1 : List of Degradation Mechanisms

WP3-2 : Preliminary Recommended Practices

#### 4.3 WP3 : Complementary Research Program

WP3-1 : Cracks analyses

WP3-2 : Residual Stresses analyses

WP3-3 : Leak-Before-Break Procedure

WP3-4 : Thinning – Pitting Analyses - Corrosions

WP3-5 : High Temperature Hydrogen Attack (HTHA)

WP3-6 : Loss of Material Properties

WP3-7 : Overload and buckling

WP3-8 : Consequences of Hydrogen Environment

#### 4.4 WP4 : Local Approach of Rupture

#### 4.5 WP5 : Complementary Risk Based Inspection Research program

#### 4.6 WP6 : Benchmarks

#### 4.7 WP7 : Final Recommended Practices Report

#### 4.8 WP8 : Synthesis and Code Cases Proposals

#### 4.9 WP9 : Knowledge Transfer

## 5 Selected Topics for this 3<sup>rd</sup> meeting

### 5.1 International Codes comparison – Priority on FFS Codes

#### 5.1.1 FFS:

- ASME/API : API 579/ASME FFS, ASME BPVC Section XI Appendices and Code Cases
- AFCEN: RSEM (A5) / RCC-MRx (A16)
- SNCT: CT Maintenance ESP
- BSI: R5-R6, BS 7910
- EC: FITNET, SINTAP
- AIEA: VERLIFE
- Others: JSME, KEPIC...

**For all of them TG7 members :**

- confirm the list

- and collect the "Table of content" of the last edition (if possible...)

- 5.1.2 **RBI:** ASME BPVC Sect XI Code Cases/Division 2 RIM, API 581, RIMAP, ENIQ, TWI, JSME, EN16991

### 5.2 Degradation mechanism to consider – Priority to crack analyses

#### 5.2.1 Cracks (from fabrication/welding/fatigue/corrosions/creep...)

5.2.2 Thinning- Pitting

5.2.3 Overloads and buckling

5.2.4 Loss of material properties: thermal ageing, strain ageing...

**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...

**Remarks and potential contribution from each TG7 members will be collected**

5.2.5 **FFS Preliminary Recommended Practices Report** for all degradation mechanisms considered: 1<sup>st</sup> for crack analyses

#### 5.2.5.1 Cracks analyses

- K, J, C\* handbook
- Defects interaction
- Fatigue crack growth:  $da/dN = \Delta K_{eff} - R$  ratio correction and negative R ratio – crack closure -threshold - mode I, II, III combination – transient combination –  $\Delta K$  or  $\Delta J$  – primary/secondary stresses – environmental effects
- Corrosion crack growth:  $da/dt - K_{max}$
- Creep crack growth:  $da/dt - C^*$
- Critical crack size: brittle / transition / ductile, mode I, II, III combination, primary/secondary stresses...
- All material data required and data/methods validation: theoretical, experimental, standards...

**Remarks and potential contribution from each TG7 members will be collected**

#### 5.2.5.2 Leak-Before-Break Procedure

- Initial crack
- Crack growth up to through wall crack
- Crack opening area and Leak flow rate
- Through wall crack critical size
- Criteria and all material data required and data/methods validation: theoretical, experimental, standards...
- standards...

**Remarks and potential contribution from each TG7 members will be collected**

#### 5.2.5.3 Consequences of Hydrogen Environment

- to be defined, based 1<sup>st</sup> on Existing Standards and Literature review
- develop Mechanism description of HT HA
- develop analysis rules

**Remarks and potential contribution from each TG7 members will be collected**

## 6 TG7- 3<sup>rd</sup> meeting conclusions

### Participant involvements on FFS and Crack Analyses

- 1. Code comparison contribution, in particular on:
  - Different methods of K evaluation
  - K handbooks general and specific cases
  - Fatigue crack growth, including methods and material properties for different environment
- 2. Literature review on "Hydrogen consequences" on "cracks analysis"
  - Definition of typical operating conditions under hydrogen environment
  - Consequences of long term operation under hydrogen environment
- 3. Preliminary Recommended Practices Reports
  - K evaluations
  - Fatigue analyses methods and open points
- 4. Draft Code Cases on "Crack Analyses"

**Remarks and potential contribution from each TG7 members will be collected**

## 7 Closing of the 3<sup>rd</sup> meeting

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**Note: Please check the EPERC website for free registration!!!**