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THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE
FRP TASK GROUP

AGENDA

Meeting of October 16th, 2023
Las Vegas, NV and MS Teams

The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229-1183
Phone: (614)888-8320
FAX: (614)847-1828

1. **Call to Order**
   The meeting was called to order at 2:00 P.M. Pacific Time.

2. **Introduction of Members and Visitors**
   The Task Group Chair, Ms. Debra McCauley, asked all present to introduce themselves. All members were present for the meeting, and a quorum was established.

3. **Announcements**
   There were no major announcements for this meeting.

4. **Adoption of the Agenda**
   A Motion was made, seconded, and unanimously approved to adopt the agenda as presented.

5. **Approval of the Minutes of April 2023 Meeting**
   The minutes can be found on the National Board website:
   https://www.nationalboard.org/Index.aspx?pageID=13&ID=18

   A Motion was made, seconded, and unanimously approved to accept the minutes from the April 2023 meeting,

6. **Review of Rosters**
   - **a.** Membership Nominations
     - **i.** None.
   - **b.** Membership Reappointments
     - **i.** The following Task Group memberships are set to expire in January of 2024: Mr. Jess Richter and Mr. Norman Newhouse.
     - **ii.** The Task Group voted unanimously to recommend Mr. Richter and Mr. Newhouse for reappointment. Their nominations will be forwarded to the NBIC Main Committee for approval.
   - **c.** Officer nominations
     - **i.** None.

7. **Action Items**

Item Number: NB16-1402	**NBIC Location: Part 2**	**No Attachment**
General Description: Life extension for high pressure vessels above 20 years **Subgroup:** FRP **Task Group:** M. Gorman (PM), N. Newhouse, J. Eihusen **April 2023 Meeting Action:** Mr. Newhouse and Mr. Eihusen will contact Mr. Mike Gorman to update the proposal for this item. **October 2024 Meeting Action:** The FRP Task Group discussed progress on the proposal for this item. The goal was to have a proposal ready to present at the next meeting.		

8. **Additional Business**
    - Mr. Eisberg discussed a guideline dealing with safety in membrane systems technologies, how to repair leaks, and how to identify problems with those vessels.
    - Mr. Geoff Clarkson spoke of fitness-for-service inspection and assessment for FRP equipment. His presentation has been attached to the end of the minutes.

9. **Future Meetings**
   January 8th-11th, 2024 – NBIC Meeting in San Antonio, TX
   April 29, 2024 – TG FRP Meeting

10. **Adjournment**

    Respectfully submitted,
    Jonathan Ellis
    Secretary

FRP Equipment: *FFS* Inspection & Assessment

Oct 2023

Geoff Clarkson, P.Eng.
Founder and Chief Technical Officer
UTComp Inc.

Agenda

- Background
- Fitness-For-Service Code
- Inspection for *FFS*
- Conclusions

Background

Definitions

- Assessment: Quantitative engineering evaluation.
- Fitness For Service: Asset or component is suitable for its intended use based on engineering analysis.
- In-service inspection: Inspection of equipment that has been completed after service conditions have been applied.

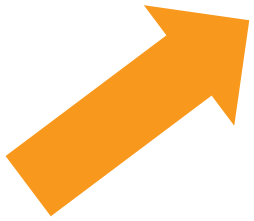
Design Codes for Assessment

The basis for metal alloys.

- If equipment complies with Code, then Fit For Service.
- Inspection finds changes that can be compared directly to the Code design.
- Other codes might provide deeper assessment.
- API 579-1/ASME FFS-1

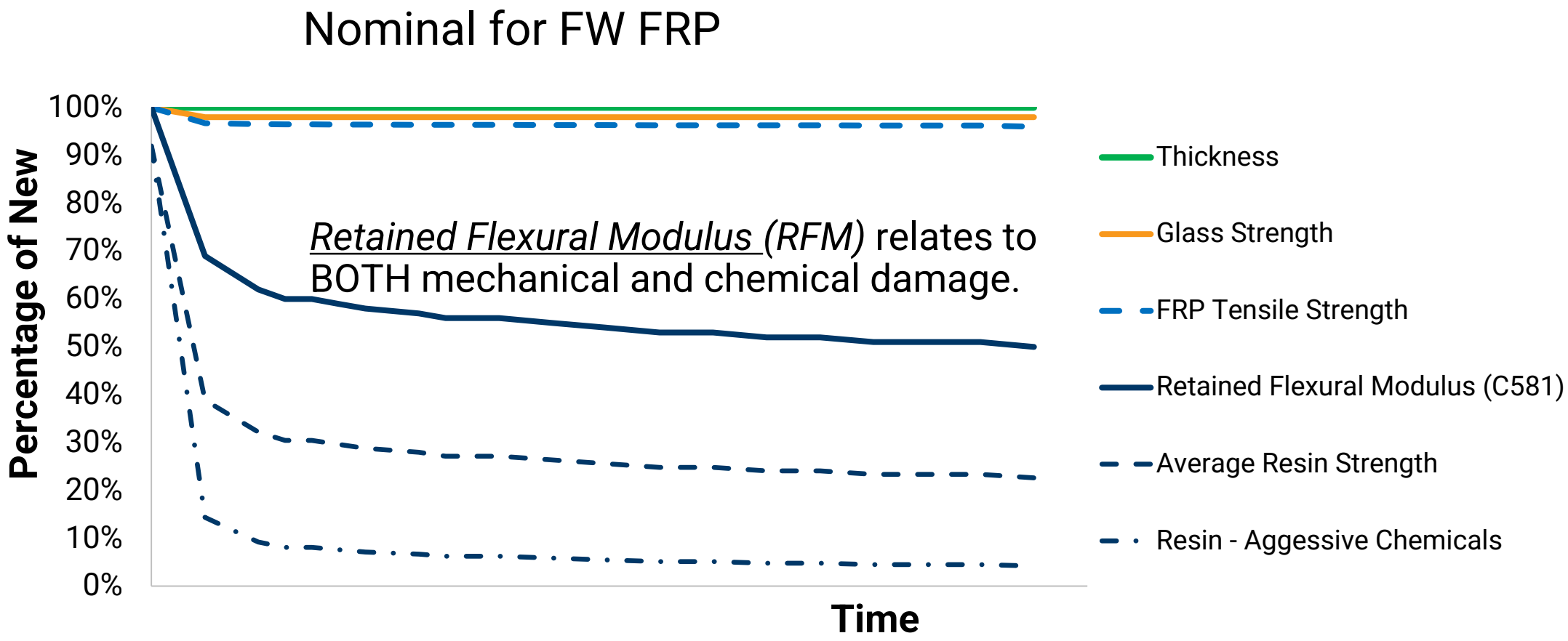
FRP is *Different from Metals*

- Construction Codes use Large *FOS* to deal with this.
- The properties that change aren't used or identified by the design Code.



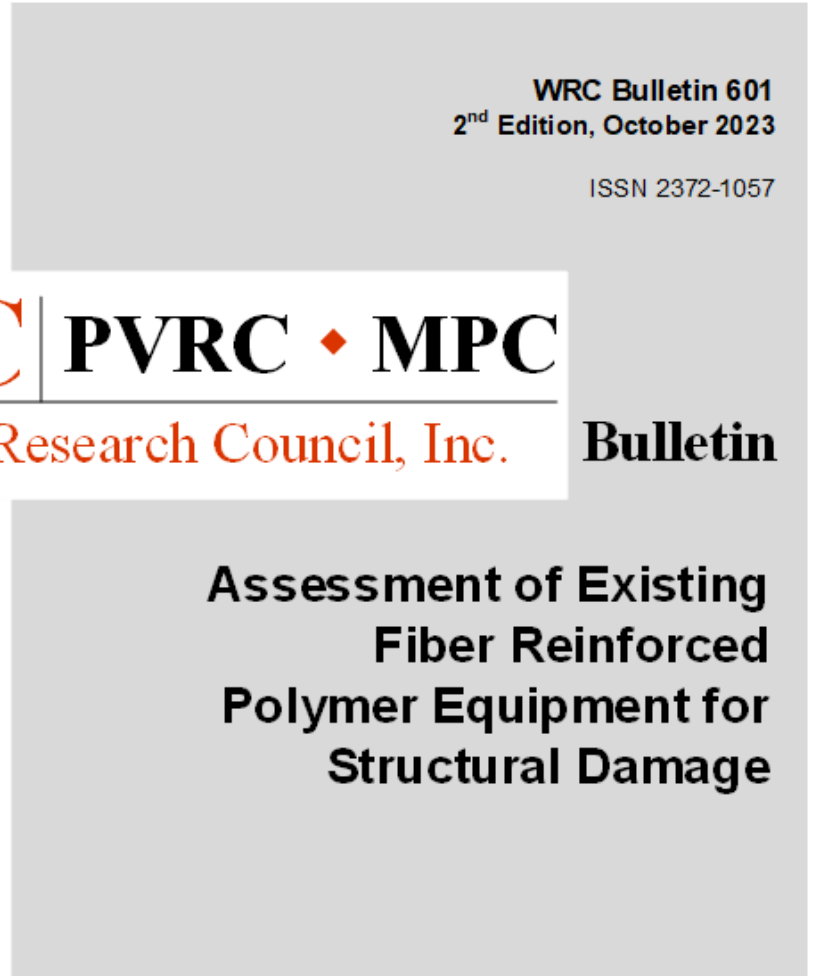
Best practice inspection has been to do what we can based on Code instructions and FRP appearance.

FRP is *Different from Metals*



Bulletin WRC 601

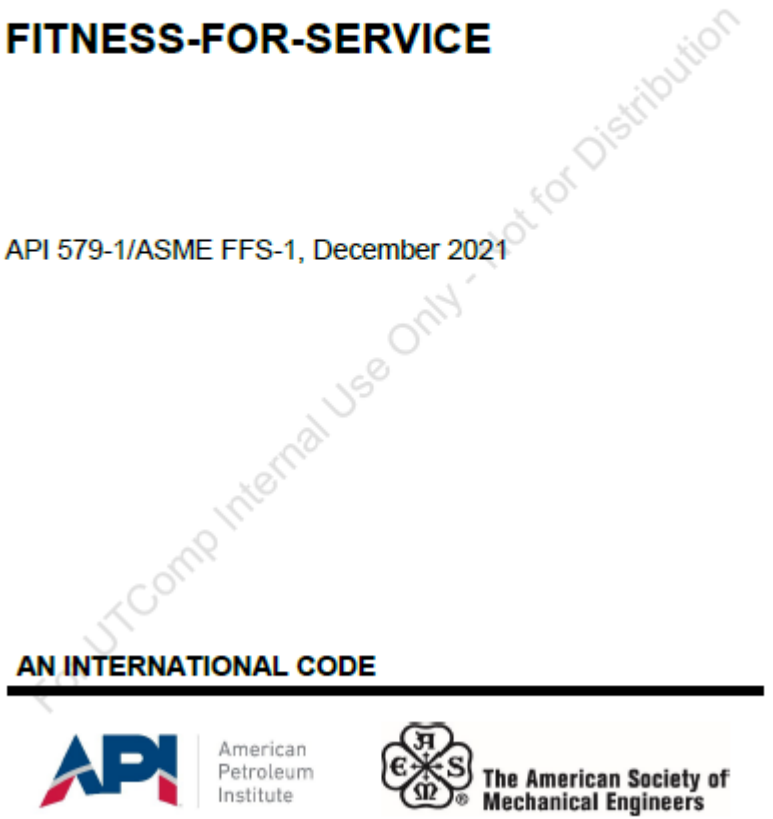
- WRC develops technology for API & ASME Codes.
- 1st Ed. Published Apr. 2023
- Provides Technical & Engineering Basis to determine *FFS* of *FRP*.
- Includes Inspection info required.
- Peer reviewed.



Fitness-For-Service Code

API 579-1/ASME FFS-1

- Provides more sophisticated assessment of equipment than provided in design codes.
- Precisely indicate whether operating equipment is fit for is intended service or whether defects or in-service deterioration threaten its integrity.
- ASME & API Joint Committee



API 579-1/ASME FFS-1 Assessment Needs

- Quantitative information that can be used in calculations.
- Non-destructive.
- Usable to calculate Remaining Life.
- API 579 usually stipulates what inspection information is required but not inspection methods.
- Multiple levels of analysis are available.

API 579-1/ASME FFS-1 Activities

- Project Team of SME's are preparing a Part for Assessment of *FRP* based on WRC 601.
- The *FRP* Part includes supporting material on Inspection methods.
- This is an *ANSI Consensus Code* where any party with a material interest has a right to participate and express positions and basis that will be considered.

Inspection for *FFS*

Inspection Needs

- Detect polymer damage within the FRP using NDE
- Provide engineering data that can be used to determine:
  - Current status of the equipment
  - Remaining Life of the equipment
  - Structural repairs or remediation that may be required or recommended
  - Objective replacement recommendations.
- Necessary Result: Retained Polymer Young's Modulus, or *RFM*

Detection Methods

- NASA Technical Memorandum 81523 -1980:
  - NDE should not be defined solely by detection of overt flaws as in metal alloys
  - Ultrasonic methods can evaluate changes to material properties caused by damage to *FRP*
  - Result: *Acousto-Ultrasonic Testing (AU)*
  - ASTM E1495
- Numerous authors since 1998:
  - Attenuation of ultrasonic pulses is inversely proportional to polymer damage
  - Result: Attenuation-based ultrasound (*UAX)*
  - ASTM C1332

Detection Methods

- Committee on Acoustic Emission from Reinforced Plastic (CARP) – 1970s:
  - In original work emissions showed good correlation to polymer damage.
  - Output is “*Pass/Fail*”
  - Result: *Acoustic Emission Testing (AE)*

Detection Method Overview

Factor	AE	AU	UAX
Current API/ASME Code Criteria	Yes	No	No
Certification Available	ASNT	SNT-TC-1A	SNT-TC-1A
Determine RFM	No	Yes	Yes
Remaining Life	No	Yes	Yes
Requires Equipment Outage	Yes	Unknown	No
Assessment of Local Damage	No	Yes	Yes

Conclusions

Conclusions

1. *FFS* methods for *FRP* Equipment are available that align with API 579-1/ASME FFS-1.
2. Options are available for detection of damage.
3. Damage can be quantified.
4. WRC 601 provides technical basis for Assessment.

Questions?

Geoff Clarkson, P.Eng
g.clarkson@utcomp.com
519.590.3252