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CASS Aging Management

MRP-227 A/LAI 7 Public Meeting

May 5th, 2016

Consideration of CASS Screening Parameters for PWRs

- Recognition of the extensive work performed by NRC Staff to develop the technical basis for the new screening values
- Agreement that high-Mo CASS data should not be applied to low-Mo CASS (CF3/CF8) variants
- Support screening of CF3/CF8 at the 1 dpa, 20% ferrite content level (based on Hull's Factors calculation)
- Expectation that a parallel approach for CF3M/CF8M will provide revised screening parameters, if required
- Expectation that screening levels for CASS variants will be provided in tabular form
- Look forward to the provision of revised guidance via ISG (i.e. a revised "Grimes Letter")

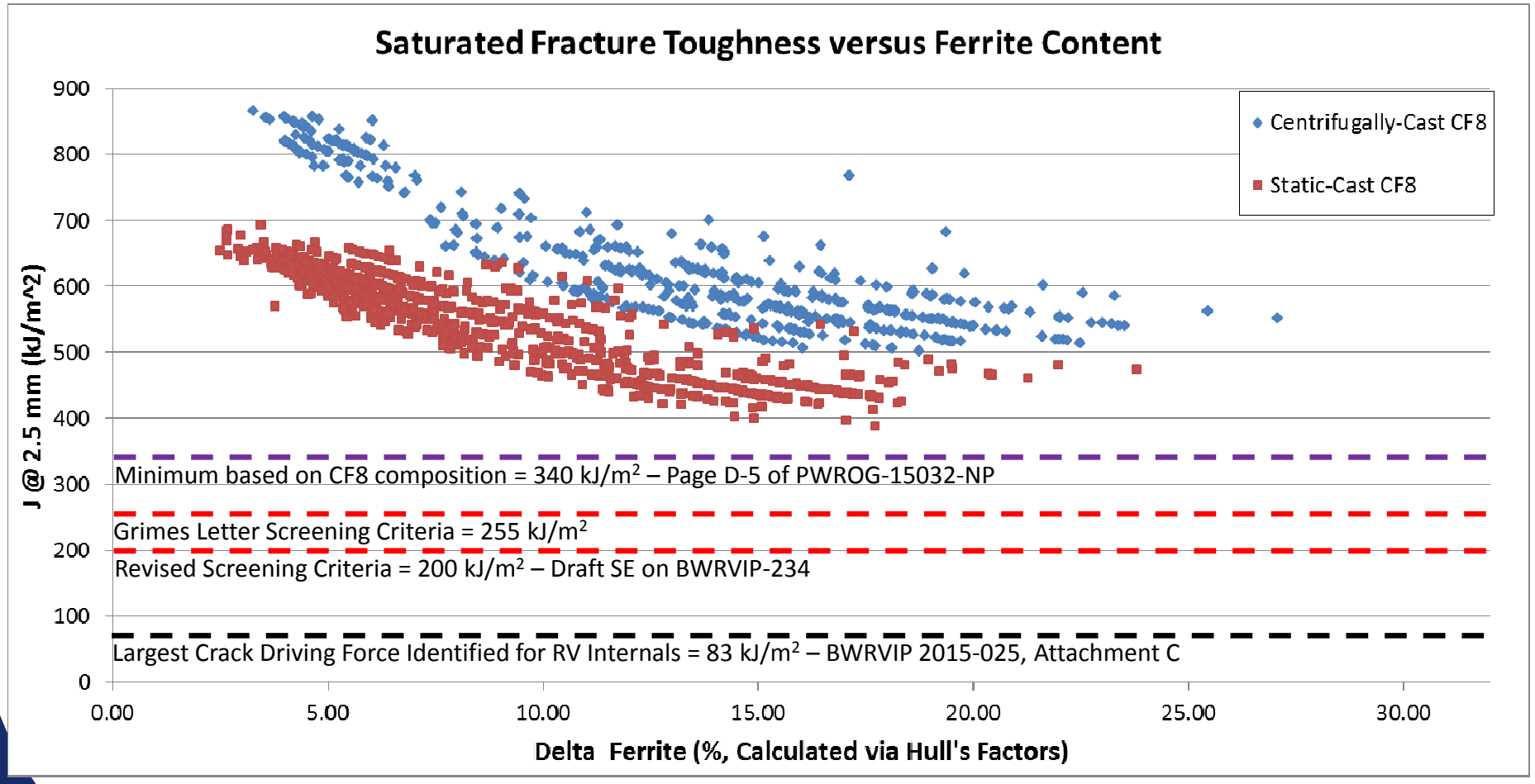
Discussion of Staff Review of PWROG-15032-NP

- Motivation for assessment driven by delays and costs incurred during development of individual plants responding to A/LAI 7
- Industry expectation that similar time and effort was expended by the staff reviewing essentially identical responses
- Submission of PWROG-15032-NP as a technical report to NRC staff for background
- Appreciate the extensive statistical review by the NRC staff
- Industry is reviewing draft RAIs on PWROG-15032-NP

Discussion of Staff Review of PWROG-15032-NP

- Analysis according to simple statistical approaches (normal/log-normal) based on expectation of consistent manufacturing processes
  - Large number of manufacturers
  - Large variation in number of lots per manufacturer
  - Deviations from normality may be due to small number of lots, no ferrite less than ~2%
- Expectation for ferrite content of randomly selected RV internals component
- Data demonstrate that random CF3/CF8 would have acceptable margin in toughness after TE

PWROG-15032-NP Calculation of Expected Saturated Fracture Toughness after TE



Saturated fracture toughness after TE calculated for all CF8 demonstrate significant margin over screening value

Discussion of Staff Review of PWROG -15032-NP

- Citation of PWROG-15032-NP would be the basis for future responses to A/LAI 7
  - ➢CASS components specified as CF8/CF3 are screened out for TE
  - ➢Expectation of low ferrite content
  - ➢Adequate fracture toughness at saturated TE conditions for any ferrite content
  - – Component material defined by plant drawings
    - Call out material (but not manufacturer)
    - Confirming specified material is sufficient to screen out for TE
  - – Still need to consider IE

Discussion of Staff Review of PWROG-15032-NP

- Screening for IE is not dependent on CASS composition
  - Recognition that irradiated wrought SS has significant loss of toughness
  - Final toughness after IE expected to be similar for CASS and wrought SS
  - Earlier IE of Ferrite phase in CASS is taken account of by reducing IE threshold from 1.5 dpa to 1.0 dpa
  - If CASS has sufficient ferrite to have early onset of IE – it will already be screened in for TE
- For components in which IE is of concern – they are already screened in for the cases in which they are fabricated from wrought SS, e.g. lower support columns (LSC)

Discussion of Staff Assessment of PWROG-14048-P

- Currently in process of expanding applicability of this report to all CE and Westinghouse plants in PWROG project
  - Gathered plant specific design data and grouped plants based on LSC and internals design similarities
  - Gathering key load inputs for all plants to consider bounding conditions
  - Additional evaluations for design or loading differences
  - Evaluating uncertainty in load data by determining sensitivity of the conclusions to changes in key inputs
  - Addressing recommendations from the Staff's assessment of PWROG-14048-P, Rev. 0. (i.e. buckling, etc.)
- Evaluations will demonstrate functionality for all Westinghouse and CE designed plants as necessary

Discussion of Staff Assessment of PWROG-14048-P

- Submittal of Rev. 1 of PWROG-14048-P to the NRC is planned for early 2nd Quarter of 2017
- PWROG-14048-P will provide the generic basis that functionality of the LSCs will be maintained for the PEO despite the potential for TE and IE
- Hence A/LAI 7 satisfied and no need to screen LSCs for embrittlement

Industry Discussion of Activities on Action Item 1 (Cold Work)

- Similar to CASS issue, extensive review of plant records to date has determined that no cold worked* material has been used in plant construction
- (In contrast to chemical composition of CASS) restrictions were in place on use of cold worked materials during plant construction
- Representative majority of plants reviewed to date
  - Extensive review of plant drawings for material call outs
  - Requires extensive search of manufacturing specifications and drawings
  - Materials of use, ASME Code, specs etc. effectively limit cold work
- To date no cold worked material has been found
- Experience has been compiled in PWROG-15105-NP
- Plan is to provide PWROG-15105-NP to the staff as a technical report (analog to PWROG-15032-NP for CASS) to support future assessment of cold work without detailed plant searches

*No cold work meaning no non-fastener cold-work greater than 20%

Questions?

The Materials Committee is established to provide a forum for the identification and resolution of materials issues including their development, modification and implementation to enhance the safe, efficient operation of PWR plants.

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